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ABSTRACT

This report compares the relative effectiveness of education systems across the developed world. Data come from the Programme for International Student Assessment, Trends in International Maths and Science Study, and the International Adult Literacy Survey. Overall, educational performance in some OECD countries is consistently better than others. A child in Finland, Canada, or Korea has a higher chance of being educated to a reasonable standard and a lower chance of falling far behind than a child in Hungary, Denmark, Greece, the United States, or Germany. The percentage of 15-year-olds judged unable to solve basic reading tasks varies from under 7 percent in Korea and Finland to over 20 percent in Switzerland, Germany, Hungary, Greece, and Portugal. High absolute standards of educational achievement are not incompatible with low levels of relative disadvantage. For OECD overall, the average gap between high and low math scores in the same year is approximately nine times the average progression between one year and the next. Between-school variance in educational performance is much higher in some countries than others. There is no simple relationship between level of educational disadvantage in a country and educational spending per pupil, pupil-teacher ratio, or degree of income equality. (SM)

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A LEAGUE TABLE OF

EDUCATIONAL

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This publication is the fourth in a series of Innocenti Report Cards, designed to monitor the performance of the industrialized nations in meeting the needs of their children. Each Report Card presents and analyses league tables ranking the performance of rich nations against critical indicators of child well-being.

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"Schools can serve to reduce or challenge existing social inequality."

Key findings

- Educational performance in some OECD countries is consistently better than in others – whether measured by the percentage of students reaching fixed benchmarks of achievement or by the size of the gap between low-achieving and average students.

- A child at school in Finland, Canada or Korea has a higher chance of being educated to a reasonable standard, and a lower chance of falling a long way behind the average, than a child born in Hungary, Denmark, Greece, the United States or Germany.

- The percentage of 15 year-olds judged *"unable to solve basic reading tasks"* varies from under 7 per cent in Korea and Finland to more than 20 per cent in Switzerland, Germany, Hungary, Greece and Portugal. The percentage considered *"unable to apply basic mathematical knowledge"* varies from 10 per cent in Korea and Japan to 45 per cent or more in Italy, Spain, Greece and Portugal.

- High *absolute* standards of educational achievement (measured by the percentage of students achieving a given benchmark) are not incompatible with low levels of *relative* disadvantage (measured by how far low-achieving pupils are allowed to fall behind the average).

- For the OECD as a whole, the average gap between high and low maths scores in the same year is approximately nine times the average progression between one year and the next (grade 7 to grade 8).

- Between-school variance in educational performance is very much higher in some countries than in others.

- There is no simple relationship between the level of educational disadvantage in a country and educational spending per pupil, pupil-teacher ratios, or degree of income inequality.

- In all OECD countries, educational achievement remains strongly related to the occupations, education and economic status of the student's parents, though the strength of that relationship varies from country to country.

- Inequality in learning achievement begins at an early age and attempts to mitigate educational disadvantage need to begin even before a child starts school through good quality early childhood care and education.

EDITORIAL

The big picture

This fourth *Innocenti Report Card* seeks to measure and compare educational under-achievement across the industrialized world.

Using data from two different surveys of students in 24 OECD countries, it presents the 'big picture' of how well each country's educational system is performing when measured by a) what proportion of students fall below given benchmarks of educational achievement and b) how far behind the national average the lowest-achieving pupils are being allowed to fall.

Overall, these data show that some countries do a very much better job than others in containing educational disadvantage. A child starting school in Canada, Finland, or Korea, for example, has both a higher probability of reaching a given level of educational achievement and a lower probability of falling well below the average than a child starting school in Denmark, Germany, Greece, Hungary, or the United States.

But the similarities between educational outcomes across the OECD nations are also revealing. In all countries under review, for example, a strong predictor of a child's success or failure at school is the economic and occupational status of the child's parents. And in all, the seeds of disadvantage are sown early.

It would be a mistake to conclude from this that disadvantage in education simply reflects inequality in society at large and that there is little that schools or governments can do about it. Some school systems do more to mitigate inequality than others. Similarly, the relationship between school performance and home background does not follow any immutable law but varies considerably from country to country.

Nonetheless it is clear that educational disadvantage is born not at school but in the home. And government efforts to contain that disadvantage – in order to foster social cohesion and maximise investments in education – must also take into account what is now known about early childhood development.

The essence of that knowledge is not complicated: learning begins at birth, and a loving, secure, stimulating environment, with time devoted to play, reading, talking and listening to infants and young children, lays down the foundations for cognitive and social skills. No government can therefore ignore the issue of what happens in the pre-school years.

All OECD countries remain committed to the principle of equality of opportunity, and to the goal of allowing each child to reach his or her full educational potential. But as this *Report Card* shows, that ideal is far from being realised. Significant levels of educational disadvantage exist in all developed nations, and the gap between children of the same age can be the equivalent of many years schooling.

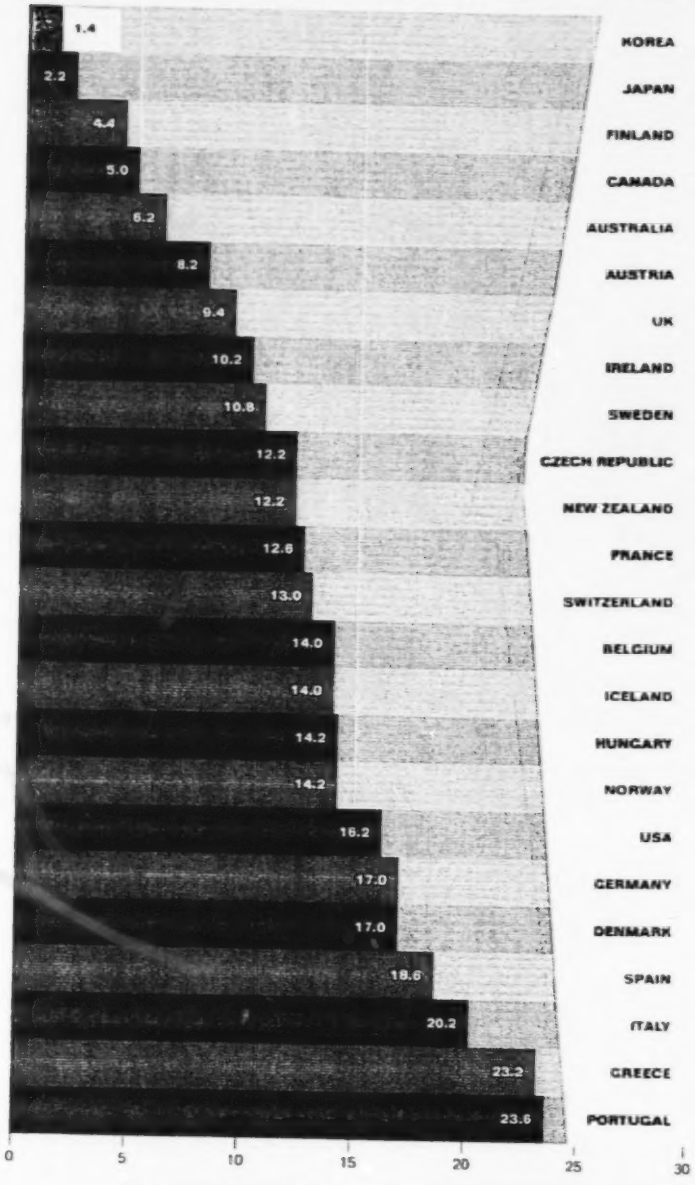
Looking back, such disadvantage at school can be seen to be strongly linked to disadvantage at home. Looking forward, it may be predicted that the disadvantage is likely to perpetuate itself through educational under-achievement and a greater likelihood of economic marginalisation and social exclusion.

Opportunities do exist – both in schools and in pre-school care and education – to minimise educational disadvantage. Failure to explore those opportunities would imply that the ideal of equality of opportunity has run out of political steam, and that the industrialized nations of the 21st century are prepared to accept a social order in which the opportunities of life remain heavily circumscribed by the circumstances of birth. ■

The educational disadvantage league

Figure 1

The table shows the average rank in five measures of absolute educational disadvantage. These measures are the percentage of children scoring below a fixed international benchmark in surveys of: reading literacy of 15 year-olds (lower threshold for PISA literacy level 2), maths and science literacy of 15 year-olds (lower quartile of all children in OECD countries in PISA 2000), maths and science 8th-grade achievement (median of all children in all countries in TIMSS 1999). Details of benchmarks and surveys are given on page 31.



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Commentary

The league table opposite (Figure 1) provides the first 'big picture' comparison of the relative effectiveness of education systems across the developed world. It is based not on the conventional yardstick of how many students reach what level of education (Box 3) but on testing what pupils actually know and what they are able to do. It therefore reflects the relative success or failure of each country in preparing its young people for life and work in the 21st century.

To achieve this, the table is based not on any one individual survey but on combining the results of both of the most recent cross-national inquiries into educational performance (Box 1). Specifically, the league table lists the developed nations according to their *average rank* in five different tables showing the percentage of 14 to 15 year-olds who fall below fixed international benchmarks of competence in reading, maths and science. (See *Sources* and Box 1 for further details of the surveys and tests.)

The highlights:-

- Two Asian developed nations – South Korea and Japan – sit firmly at the head of the class with average league table ranks of 1.4 and 2.2 respectively.
- Germany, with its strong educational and intellectual tradition, occupies 19th place out of the 24 nations.
- Canada, with an average rank of 5, fares significantly better than the United States, with an average rank of 16.2.
- Norway and Denmark, traditionally high-taxing, high-spending countries with well developed public services, languish in the bottom half of the league table.
- The Czech Republic ranks above the majority of Western European nations.
- The United Kingdom, where hand-wringing over educational failures is a national pastime, fares better than all other countries in the European Union except Finland and Austria.
- The southern Mediterranean props up the table, with Spain, Italy, Greece and Portugal occupying the bottom four positions.

The nations of the OECD

The *Innocenti Report Cards* investigate child well-being in rich nations. The series draws on data from the 30 members of the Organisation for Economic Co-operation and Development (OECD), the group of countries that produce two-thirds of the world's goods and services.

Drawing the big picture

The major international studies of educational performance published during the last two years have aroused a great deal of political and public interest.[1] But each study has been taken in isolation, each has adopted a different approach and emphasis, and each has been challenged on one ground or another: Is the testing culturally and linguistically neutral? How is a 'soft' value like literacy to be defined and measured? Are curriculum differences adequately taken into account? Is the sampling representative? Are the students under test similarly motivated? As *The Economist* commented following one such survey, *"The results may say more about the inconsistency of international comparisons than about particular policies."*[2]

The OECD member countries are: Australia, Austria, Belgium, Canada, the Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Japan, the Republic of Korea, Luxembourg, Mexico, the Netherlands, New Zealand, Norway, Poland, Portugal, the Slovak Republic, Spain, Sweden, Switzerland, Turkey, the United Kingdom of Great Britain and Northern Ireland, and the United States of America.

It has not been possible to include every country in this *Report Card* as comparable data on education are not available for all 30 members.

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While not immune from such questioning the main league table presented in this *Report Card* (Figure 1), based on the *average rank* of each nation in recent cross-national surveys of student achievement, offers a more stable and reliable overview. And by drawing on five separate tests conducted under the aegis of two separate surveys – covering reading literacy, maths, and science – it also presents the most comprehensive picture to date of how well each nation's educational system is functioning *as a whole*.

The surveys

The two major surveys used in the construction of the league table are the Programme for International Student Assessment (PISA) and Trends in International Maths and Science Study (TIMSS). A third study, the International Adult Literacy Survey (IALS), which tests students in a smaller number of OECD countries, has been drawn upon for purposes of corroboration and comparison.

All three of these surveys have very different aims and methods (Box 1):

TIMSS is a long-running study (conducted by the International Association for the Evaluation of Educational Achievement) which regularly tests large samples of pupils in different countries in order to determine the extent to which they can understand and apply essential maths and science knowledge. For example the latest round of TIMSS asked 14 year-olds in over 50 countries to subtract 4078 from 7003 and found that the wrong answer was given by 49 per cent in the UK, 42 per cent in New Zealand and 33 per cent in Italy, compared to 14 per cent in Japan, 13 per cent in Hungary, and 12 per cent in Korea. The most recent (1999) TIMSS data, for both maths and science, have been incorporated into the main league table of this *Report Card* (Figure 1), together with information from 1995 for those countries not included in the 1999 TIMSS.

PISA, initiated by the OECD in 2000, has chosen a more ambitious path by attempting to determine to what extent *"education systems in participating countries are preparing their students to become lifelong learners and to play constructive roles as citizens in society."*[3] Every three years, this 32-nation programme administers a two-hour examination to over a quarter of a million young people nearing the end of compulsory education. The questions, designed to measure ability in reading literacy, scientific literacy, and mathematical literacy, are drawn up by an international group of experts including employers as well as educationalists.

Lastly, IALS is a more specific initiative that attempts to track literacy levels in 15 countries by testing sample sets of adults (aged 16 to 65) for 'prose', 'document', and 'quantitative' literacy. The focus is on the skills necessary for everyday tasks, and the performance of recent school leavers (16 to 25 year-olds) offers yet another indication of how well education systems are serving young people as they enter adulthood.

These very different measures of educational performance have no common denominator by which their test scores might be combined. But in view of the obvious advantages of bringing such studies into a single overview, this *Report Card* does so by calculating the *average rank* of each country in each of the different league tables generated by the PISA and TIMSS inquiries.[4,5]

Levels of disadvantage

Average rank therefore serves as the means for putting such surveys onto a common scale. But rankings are concerned only with relative order, and not with the *levels* of educational disadvantage in each country. In order to glimpse this underlying reality, Figures 2a and 2b present examples of two of the individual league tables on which the principal league table of this *Report Card* (Figure 1) is based.

Figure 2a shows the percentage of 15 year-olds in each country who fall below PISA's Level 2 for reading literacy. Such students, according to PISA, are *"unable to solve basic reading tasks, such as locating straightforward information, making low-level inferences of various types, working out what a well-defined part of a text means, and using some outside knowledge to understand it."* And as the table shows, the percentage of students judged to be disadvantaged in this way varies considerably – from 6 per cent or 7 per cent in Korea and Finland to 20 per cent or more in Switzerland, Germany, Hungary, Greece and Portugal.

Taking a different league table as an example, Figure 2b shows the percentage of 8th grade students in each country who, according to the TIMSS organisers, are *"unable to apply basic mathematical knowledge in straightforward situations"* (defined by falling below the international median maths score for all 8th grade students in the more than 50 countries participating in TIMSS 1999). And again, the percentage of students failing to reach this benchmark varies from around 10 per cent in Korea and Japan to 45 per cent or more in Italy, Spain, Greece and Portugal.

Comparing the two tables it can be seen that there are some significant changes in the rank order of countries, illustrating the danger of relying exclusively on any one study. Nonetheless it is clear from both that there are marked differences in educational performance between the nations of the OECD. It is also clear that failure to reach the benchmarks on

which these tables are based is likely to translate into a serious disadvantage in everyday life (although it is important to acknowledge that the use of any such benchmark requires the substitution of a straight line for a blurred boundary; in practice there is likely to be very little difference, for example, between a student who barely succeeds in achieving level 2 on the PISA reading literacy scale and a student who barely fails to achieve it).

Averaging the national rankings seen in these very different league tables therefore offers a more robust overview, not of the level of disadvantage in each country, but of the *overall performance of educational systems in limiting that disadvantage.*[6,7]

Figure 2a League table of absolute disadvantage in reading (PISA)

The graph shows the percentage of 15 year-olds at or below PISA reading literacy level 1.

Figure 2b League table of absolute disadvantage in maths (TIMSS)

The graph shows the percentage of 8th-graders not reaching the median of maths achievement of all children in all countries in TIMSS 1999.

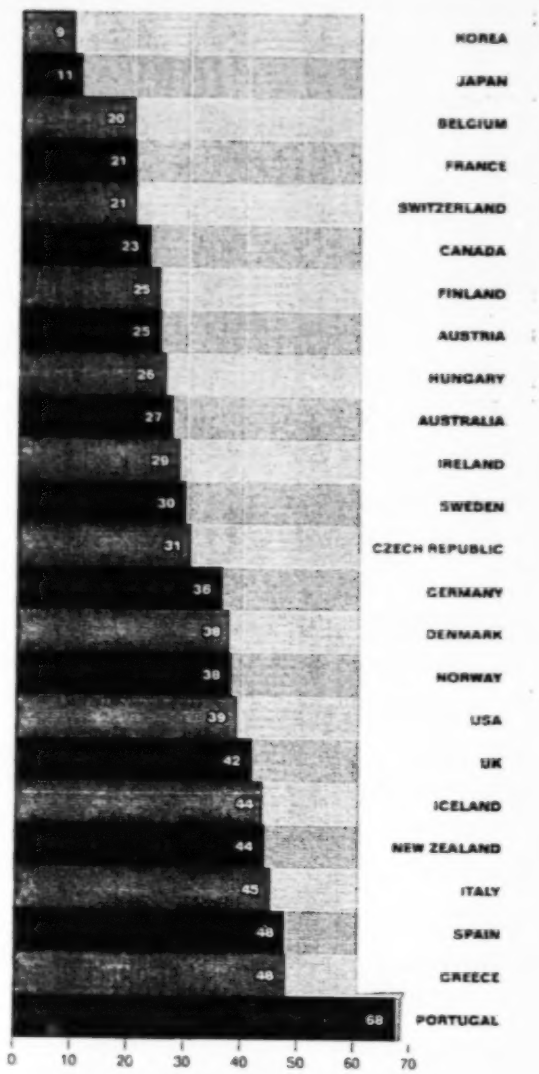

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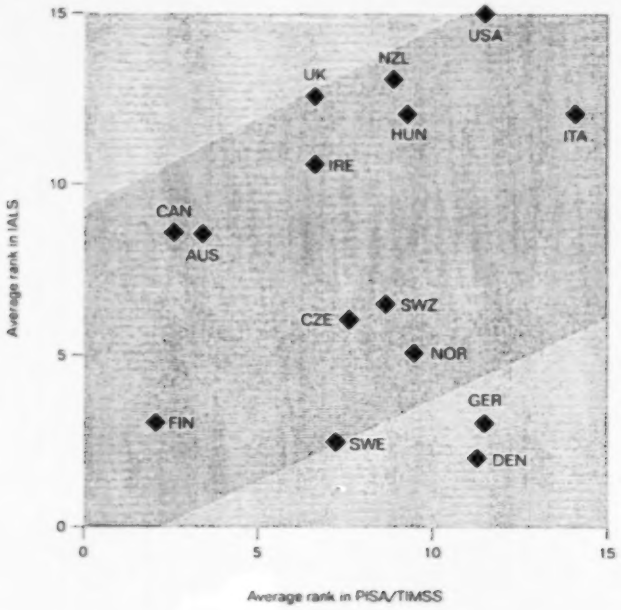
Figure 3 Absolute educational disadvantage in PISA/TIMSS and IALS

The PISA/TIMSS average rank is calculated on the same basis as in Figure 1 but only for the countries which also participated in IALS. The rankings are therefore for 15 countries rather than the 24 in Figure 1. The IALS average is of rankings on three measures: the percentages of 16-25 year-olds at the lowest level (level 1) of prose, document and quantitative literacy. The outer limits of the darker-shaded band are parallel to a regression line estimated for all countries except Denmark and Germany.



Unfortunately the International Adult Literacy Survey covers only 15 OECD nations and therefore cannot be incorporated into this combined overview. But a comparison of average PISA/TIMSS rankings with IALS rankings for young people in the 15 countries common to all three surveys again shows an encouraging consistency (Figure 3) and suggests that something significant is being revealed. (Although there are one or two marked anomalies: Germany and Denmark have a very high IALS rank and a very low PISA/TIMSS rank, again illustrating the danger of treating any one survey with undue reverence.)

Relative disadvantage

Figure 1 has looked at each country's average rank across five different measures of absolute educational disadvantage – the percentage of students in each country whose performance falls below fixed benchmarks.

This measure of *absolute* under-achievement is one way of assessing a nation's educational performance and is widely regarded as an important indicator – not least because countries in which a large proportion of students fail to reach given levels of competence clearly have a cause for concern over future productivity and competitiveness.

But most governments are also concerned about education as a means of furthering equality of opportunity and social cohesion. The degree of inequality in educational outcomes – or *relative* educational disadvantage – is therefore also an important indicator of a nation's educational success or failure.

Relative disadvantage, like relative poverty, is a slippery concept. Measuring the gap between lowest and highest performing students, for example, may not be particularly helpful as there is widespread agreement that enabling the ablest children to realise their full potential is a good thing. But there is also a consensus that allowing the lowest-achieving students to fall too far behind is a bad thing, and this suggests that the more useful measure of inequality or *relative* disadvantage is the gap in scores between lowest and average scores.

Is it possible to overview recent cross-national education surveys and compare countries on this basis?

Figure 4 is a first attempt to do this for the nations of the OECD.

Using data from the same five TIMSS and PISA tests, the table ranks each country according to the size of the gap in test scores between its low-achievers (5th percentile) and its middle-achievers (50th percentile); it then averages those rankings to produce a league table of *relative* educational disadvantage. In other words, it compares the industrialized nations on the criterion of 'how far behind are the weakest students being allowed to fall?'

This first overview of 'bottom-end inequality' shows some significant differences from the league table of absolute disadvantage (Figure 1). Three countries fall by 10 places or more (Australia, New Zealand and Belgium). And four countries rise by 10 places or more (Iceland, Italy, Portugal and Spain). But the table also reveals significant information about the relationship between high absolute standards and inequality. It shows, for example, that it is

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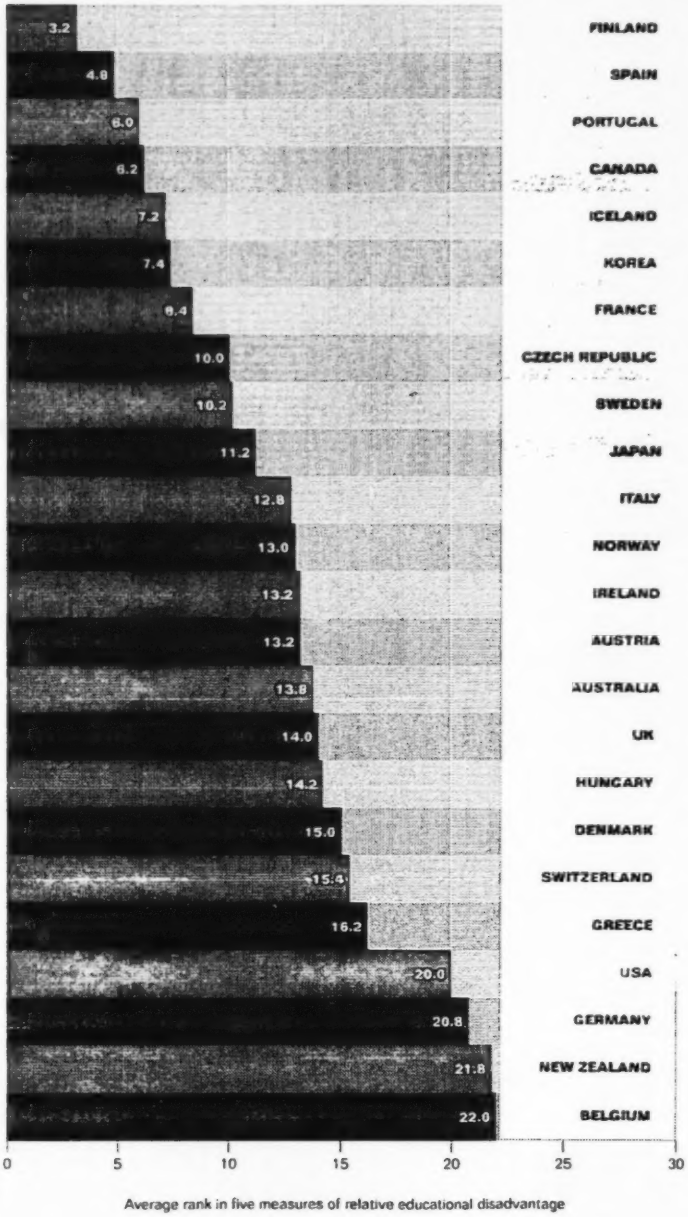
Figure 4 The relative educational disadvantage league

The table ranks countries by the extent of the difference in achievement between children at the bottom and at the middle of each country's achievement range. It shows the average rank in five measures of relative educational disadvantage: the difference in test score between the 5th and 50th percentiles in each country in surveys of reading, maths, and science literacy of 15 year-olds (PISA), and of maths and science 8th-grade achievement (TIMSS).



possible for a country such as Portugal to perform poorly when measured by an absolute standard (what percentage of students are falling below a given educational benchmark) while performing well when measured by the degree of 'bottom-end inequality' (how far behind the average are low-achieving pupils allowed to fall). But it also shows that a country such as Greece is capable of performing poorly on both scales.[8]

A comparison of these PISA/TIMSS rankings of relative disadvantage with the findings from IALS (Figure 5) once more reveals a broadly consistent picture – with the notable exceptions of Germany and Denmark which again perform better under IALS than under PISA/TIMSS.

Overall, Figure 4 is significant for a new view of educational performance across the OECD – ranking the developed nations by 'bottom-end inequality' in educational outcomes. Countries at the top of the league are doing relatively well in containing inequality by not allowing their low-achievers to fall too far behind average performance in the nation's schools. Countries at the bottom of the table are allowing much wider educational gaps to open up. At the moment, very little is known about why and how some developed countries are able to do better than others in containing educational disadvantage; but as the social and economic consequences are likely to be significant, more research is needed into the links between educational disadvantage and educational policy and practice.

Feeling the width

Averaging national rankings for relative educational disadvantage makes it possible to combine the results of different cross-national inquiries. But they again tell us little about the degree of disadvantage involved or significance

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Testing, testing...

This *Report Card* uses data from three different international assessments of learning achievement or 'functional literacy' (the ability to use information in various formats to function effectively in modern society).

The Trends in International Mathematics and Science Study (TIMSS) of 1995 and 1999 covered a total of 52 countries in one or other year (or both). The *Report Card* focuses on the eighth grade children in TIMSS, typically aged 14, of whom the study contained about 3800 per country.

The Programme for International Student Assessment (PISA) surveys 15 year-olds, assessing their 'preparedness for adult life' near the end of compulsory schooling through measurement of maths, science and reading literacy. While TIMSS focuses more on measuring mastery of an internationally agreed curriculum, PISA is intended to measure broader skills, trying to look at how students would be able to use what they have learned in real-life situations. The first PISA assessment took place in 2000 covering 32 countries. On average, 5700 children in each country took part.

The 1994-98 International Adult Literacy Survey (IALS) covered 21 countries. IALS was designed to measure the ability of people of working age (16 to 65) to use their skills to perform everyday tasks, through the assessment of proficiency in three areas: prose literacy (understanding and using information from texts), document literacy (locating and using information contained in various formats) and quantitative literacy (applying arithmetic to numbers in printed material). About 3500 people per country were assessed, including in each case nearly 700 young people aged 16 to 25.

What sorts of questions are asked?

The questions vary considerably from survey to survey. The same is true of style: TIMSS has more multiple-choice questions than PISA and IALS has no multiple-choice questions at all.

The examples given below are of questions that typically would *not* be answered correctly by those scoring below the benchmarks used in this *Report Card* for educational disadvantage in the 'absolute' sense – a common international threshold.

TIMSS maths: "n is a number. When n is multiplied by 7, and 6 is then added, the result is 41. Which of these equations represents this relation?" (Answer: A)

A. $7n + 6 = 41$
B. $7n - 6 = 41$
C. $7n \times 6 = 41$
D. $7(n + 6) = 41$

TIMSS science: "A small animal called the duckbilled platypus lives in Australia. Which characteristic of this animal shows that it is a mammal?" (Answer: B)

A. It eats other animals.
B. It feeds its young milk.
C. It makes a nest and lays eggs.
D. It has webbed feet.

PISA maths: From a drawing of the dimensions of a farmhouse roof in the shape of a pyramid, children were asked to calculate the area of its base, the attic floor. It is stated the attic is in the form of a square, two sides of which are labelled '12m'. (Answer: 144 m^2).

PISA science: "Fevers that are difficult to cure are still a problem in hospitals. Many routine measures serve to control this problem. Among these measures is washing sheets at high temperatures. Explain why this helps to reduce the risk that patients will contract a fever." (A correct answer would refer, for example, to the killing or removal of bacteria or micro-organisms, germs, viruses or to the sterilisation of the sheets.)

PISA reading: After reading an extract from a play by Jean Anouilh children had to work out what the play is about. One character is playing a trick on another and a multiple-choice question is asked about the purpose of the trick.

IALS prose literacy: A question based on an article about the impatiens plant asks the reader to determine what happens when the plant is exposed to temperatures of 14°C or lower. To give the correct answer the reader needs to note a sentence in a section of the article on 'General care' that states "When the plant is exposed to temperatures of 12 to 14°C, it loses its leaves and won't bloom anymore."

IALS document literacy: The reader has to look at a chart to identify the year in which the fewest people were injured by fireworks in the Netherlands. One part of the chart, titled 'Fireworks in the Netherlands', shows numbers representing money spent on fireworks in each year, whereas the other, titled 'Victims of fireworks', uses a line graph to show annual numbers of people treated in hospitals.

IALS quantitative literacy: A weather chart and table from a newspaper are given and the question is asked as to how many degrees warmer today's high temperature is expected to be in Bangkok than in Seoul. The reader must look through the table to locate the temperatures in the two cities and then subtract one from the other to determine the difference.

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of the variation between countries. What does it mean in practical terms to say that Belgium, New Zealand and Germany have the largest gaps between average students and low-achievers?

Hidden in the data of recent cross-national education surveys is a great deal of information to help answer this question.

Figure 6, for example, takes the measure of inequality in a different way. It shows that TIMSS maths scores in Portuguese schools rise on average by more than 30 points between grade 7 and grade 8, but that within grade 7 the difference between the scores of the lowest and highest achievers is approximately 220 points. In other words, the difference between the best and worst scores within the same year is almost

Figure 5 Relative educational disadvantage in PISA/TIMSS and IALS

The PISA/TIMSS average rank is calculated on the same basis as in Figure 11 but only for the countries which also participated in IALS. The rankings are therefore for 15 countries rather than the 24 in Figure 11. The IALS average is of rankings on three measures: the differences between the 5th and 50th percentiles of test scores of 16-25 year-olds in each country in prose, document and quantitative literacy. The outer limits of the darker-shaded band are parallel to a regression line estimated for all countries except Denmark and Germany.

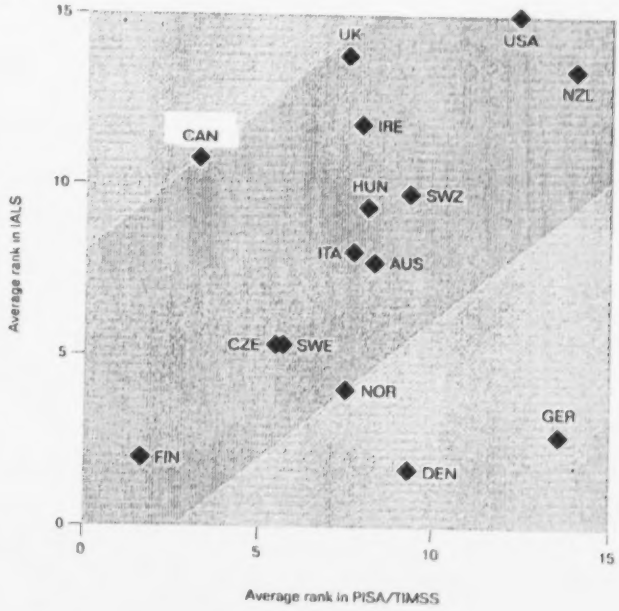
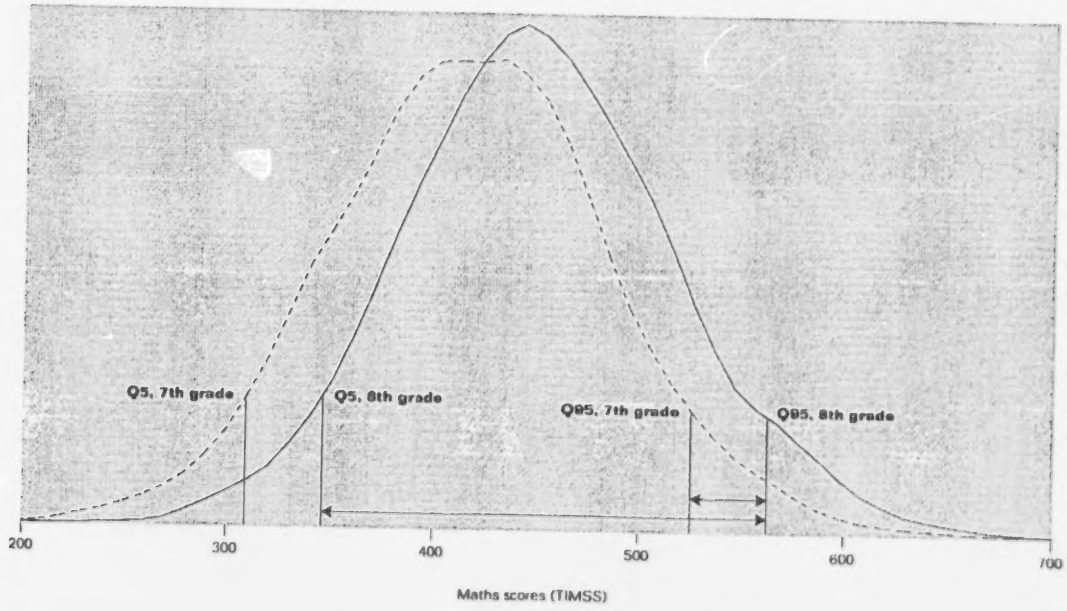


Figure 6 Maths achievement in 7th and 8th grades in Portugal (TIMSS)

The dotted line shows the distribution of maths scores in 7th grade, while the continuous line shows the distribution in 8th grade. The long arrow shows the distance between the 5th and 95th percentile (in 8th grade), while the short arrow shows the distance between 7th and 8th grade (at the 95th percentile).



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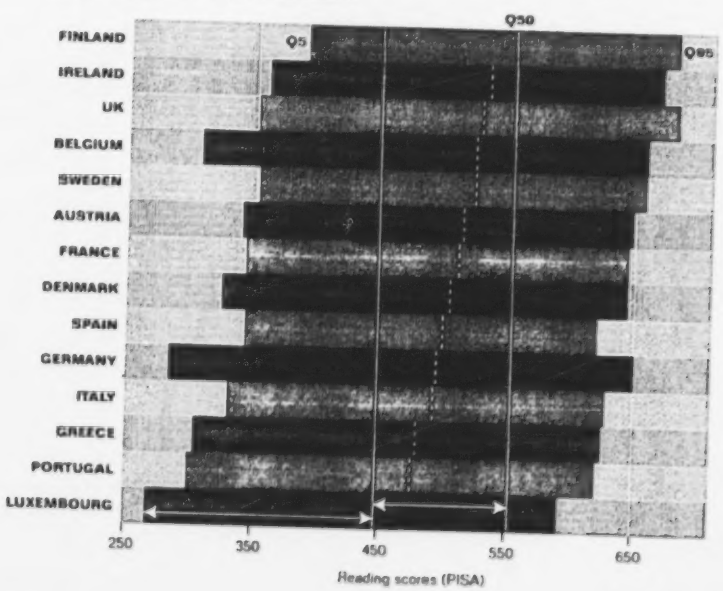
seven times greater than the increase in scores between one year and the next. And Portugal, it should be noted, is one of the countries with the least 'bottom-end inequality' (Figure 4). Averaged over the OECD nations as a whole, the gap between highest and lowest scores within the same grade is approximately *nine times* the average progression expected between grade 7 and grade 8.

Applying such calculations to the league table of relative educational disadvantage (Figure 4) gives an insight into what it means for a country to be near the top or near the bottom of the table. It means, for example, that low-achieving pupils in Finland or Spain are approximately 3.5 years behind *the average* Finnish or Spanish 8th grader; whereas in Germany, New Zealand and Belgium the low-achievers are approximately 5 years behind.

Figure 7 offers yet another handle by which to grasp the extent of disadvantage. Taking 14 European Union countries, it compares national median scores for PISA reading literacy with the scores of each country's lowest and highest achievers. And it reveals that the difference between nations with the highest and lowest median scores (Finland and Luxembourg) is about 100 points, whereas the average difference between low-achievers and average students *within countries* is just over 175 points (and as high as 200 points in Germany and Belgium). Averaged across the 14 countries, the difference between the scores of middle-achievers and low-achievers is more than one and a half times the difference between the median scores of the lowest-scoring and highest-scoring nations.

Figure 7 Variation in reading literacy in European Union countries (PISA)

The chart shows the extent of differences in reading literacy scores in each country. The bars extend from the 5th to the 95th percentiles of the national distributions. The lines approximately at the middle of each bar correspond to the median, or 50th percentile. The long arrow shows the distance between the 5th and 50th percentiles in one country. The short arrow shows the distance between the medians of the countries with the highest and lowest average achievement.



Relative disadvantage within countries is therefore significant in all OECD nations, with gaps in test scores between low and average achievers being significantly wider than both the differences in average scores between nations and the differences that can be expected between one year of schooling and the next.

A combined view

So far this *Report Card* has presented two different kinds of league table in an attempt to compare the overall educational performance of the world's developed countries.

Figure 8 takes the process one stage further by attempting to combine these two overviews into a single picture. To do so, it separates the league table of *absolute* educational disadvantage (Figure 1) into three divisions of eight countries each. Within those divisions, it then orders countries according to their rank in the league table of *relative* educational disadvantage. This somewhat complicated procedure permits a two-dimensional picture of educational performance across 24 OECD nations, and it reveals some surprising results.

Three countries – Finland, Canada, and Korea – are seen to have a very high average ranking whether judged by absolute or relative educational disadvantage. Meanwhile at the other end of the scale are to be found a surprising collection of countries – Greece, Denmark, Germany, Hungary and the United States – with a low average ranking no matter which lens is used.

Apart from providing a snapshot of all-round educational performance, Figure 8 also demonstrates the important point that high *absolute* standards of achievement are not incompatible with low levels of *relative* disadvantage.

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Figure 8 Absolute and relative educational disadvantage

The table compares average ranks in absolute educational disadvantage and in relative educational disadvantage (these ranks are as in Figure 1 and Figure 4). Countries are first ordered by average rank in absolute disadvantage and are divided into three groups on this basis. They are then ordered by average rank in relative disadvantage within these three groups. Dark blue denotes the worst performing countries, medium blue the average performers, and light blue the best.

	Absolute	Relative
FINLAND	4.4	3.2
CANADA	5.0	6.2
KOREA	1.4	7.4
JAPAN	2.2	11.2
IRELAND	10.2	13.2
AUSTRIA	8.2	13.2
AUSTRALIA	6.2	13.6
UK	9.4	14.0

	Absolute	Relative
ICELAND	14.0	7.2
FRANCE	12.6	8.4
CZECH REPUBLIC	12.2	10.0
SWEDEN	10.8	10.2
NORWAY	14.2	13.0
SWITZERLAND	13.0	15.4
NEW ZEALAND	12.2	21.8
BELGIUM	14.0	22.0

	Absolute	Relative
SPAIN	18.6	4.0
PORTUGAL	23.6	6.0
ITALY	20.2	12.8
HUNGARY	14.2	14.2
DENMARK	17.0	15.0
GREECE	23.2	16.2
USA	16.2	20.0
GERMANY	17.0	20.8

Figure 9 adds another dimension to the overview by presenting what little evidence exists on the question of whether educational standards have improved or deteriorated in recent times. Specifically, it shows the percentage of adults in five different age groups who are judged by IALS to be proficient at 'Level 1 prose literacy'. According to IALS organisers, these are people with *"very poor literacy skills, for example unable to determine the correct amount of medicine to give to a child from information printed on the package."*

As the graph shows, the reach of IALS stretches back to those who were in junior school in the 1940s and 1950s, making visible the dramatic decline in illiteracy in all participating countries during the third quarter of the 20th century. However the graph also reveals a marked levelling out of that decline in recent times. Such a levelling, it might be argued, is only to be expected after so prolonged and steep a decline; but the worrying point to emerge from Figure 9 is that illiteracy in the great majority of OECD countries appears to be stabilising sooner than expected and at a higher level. In only 4 countries – Denmark, Finland, Norway and Sweden has illiteracy among 16 to 25 year-olds been driven down below 5 per cent. And in many nations – including Canada, New Zealand, the UK and the United States – illiteracy among these young adults is running at 10 per cent or more and has remained approximately stable for two decades.

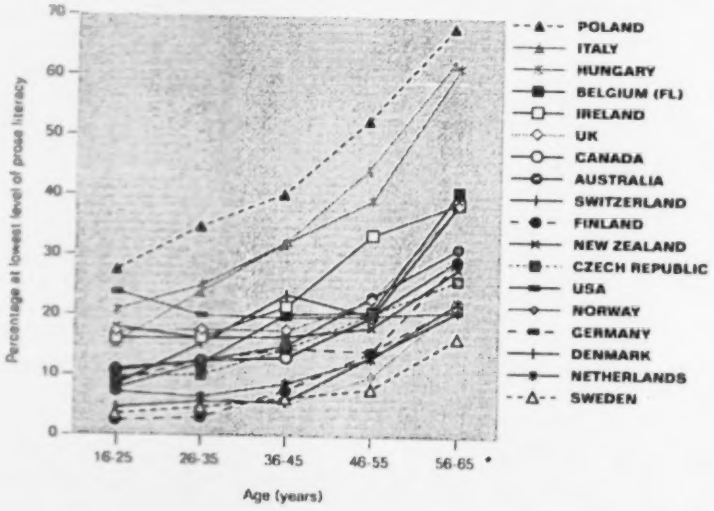
Given the deepening disadvantage implied by illiteracy in an age of information, an illiteracy rate of 1 in 10 in any industrialized country is a statistic of shame.

Can ranks be explained?

Unfortunately, the current state of knowledge and analysis offers no

Figure 9 Absolute educational disadvantage by age group (IALS)

The figure shows the percentage of people at the lowest literacy level (level 1) on the IALS prose scale, by age group.



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comprehensive explanation of why individual countries stand where they do in the league tables of absolute and relative educational disadvantage.

Across different countries and cultures, a great many variables come into play. Korea's high ranking, for example, has been variously ascribed to standards of in-service teacher training, to the long 220-day Korean school year, and to *"the passionate attitudes of both students and parents towards education."*[9] Finland's almost equally high standing has been put down to the long winter evenings and to the relative ease of learning the Finnish language which, according to Professor Sig Prais, may help Finland's children to read and write more easily, so reducing the scope for disparity to become established at an early age.[10] And in Sweden it is possible that specific reforms consciously aimed at reducing educational inequality have made a significant difference (Box 4).

Looking for explanatory factors at the cross-national and statistical level proves a more frustrating exercise. Figure 10, for example, cross-examines some obvious suspects, starting with national differences in expenditures per pupil up to the age of 15 (Figure 10a). And although raw comparisons of this type should not be expected to reveal the impact of marginal differences in wealth or educational spending, the results nonetheless show that there is no relationship obvious enough to offer a straightforward explanation of national standings. Indeed the country at the top of the league table presented in Figure 1 – the Republic of Korea – spends approximately the same amount per pupil as the two nations at the bottom of the table – Greece and Portugal. This does not mean that money does not matter. But it is clearly not the all-dominant factor in explaining the success or failure of national education systems.

Figure 10b also looks at whether there might be a relationship between *relative* educational disadvantage and income inequality. But again no obvious pattern emerges. Germany, for example, is one of the poorer performing countries when it comes to relative educational disadvantage yet it has a more equal pattern of income distribution than other large Western European nations.

Finally Figure 10c questions another plausible suspect – the pupil-teacher ratios of different nations. But once more no obvious relationship is revealed. Again, it should not be concluded that differences in school resources, including numbers of teachers, have little impact. The quality of teachers, in particular, is likely to exert an enormous leverage on educational outcomes. All that is demonstrated by Figure 10c is that differences in this *measurable* dimension of school resources do not seem to be a major determinant of the differences in educational performance between nations. Were it possible to devise an internationally applicable measure of the number of 'good teachers' then the comparison might tell a different story.[11]

Yet another possible explanatory factor might be major differences in educational systems and policies between one country and another. Might it be, for example, that countries with more comprehensive systems produce less relative educational disadvantage than countries with selective systems?

The difficulty here is that selection may be either explicit or implicit. A comprehensive school may in reality be selective by virtue of its geographical location or by the exercise of parental choice. Selectivity in different school systems cannot therefore be established simply by asking whether or not a

Figure 10a Absolute educational disadvantage and educational expenditure

Educational expenditure refers to average spending per child from beginning of primary education up to age 15, expressed in US dollars using purchasing power parities. Absolute educational disadvantage is as in Figure 1.

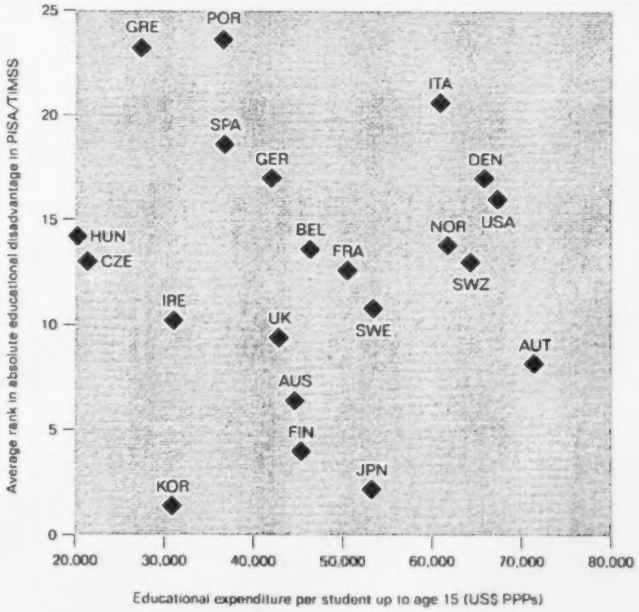


Figure 10b Relative educational disadvantage and income inequality

The index of income inequality is the Gini coefficient of per capita household income: higher values indicate greater inequality. Relative educational disadvantage is as in Figure 4.

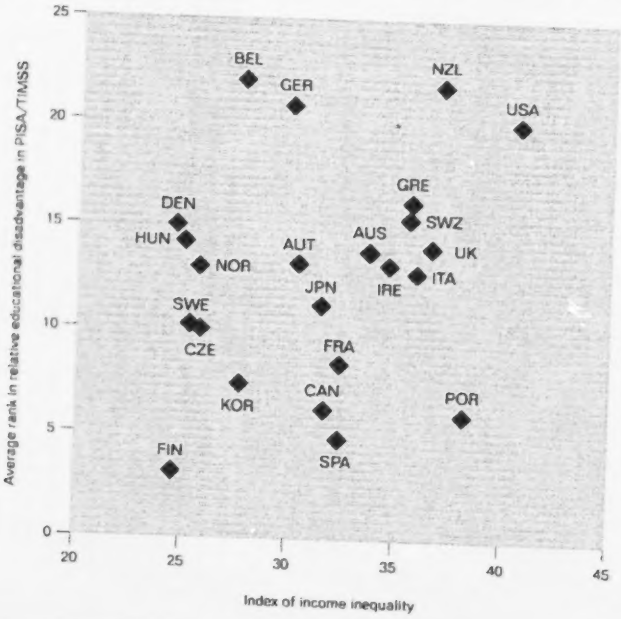
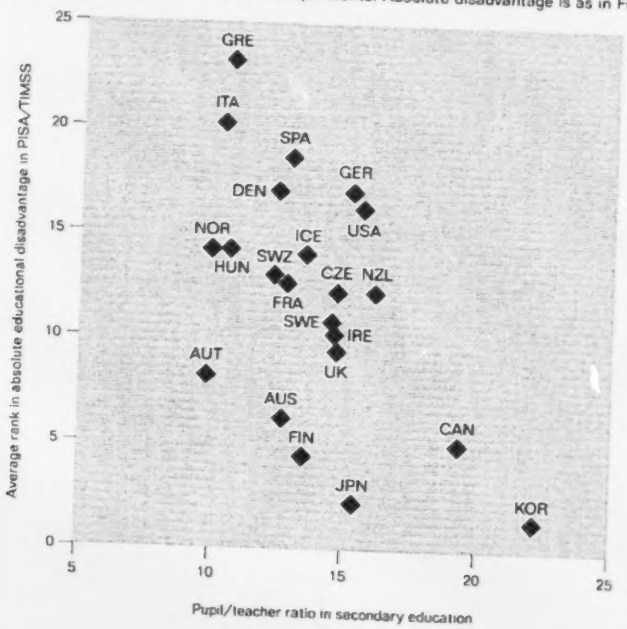


Figure 10c Absolute educational disadvantage and pupil/teacher ratio

Pupil/teacher ratios in secondary education are for public and private institutions in 1999, with calculations based on full-time equivalents. Absolute disadvantage is as in Figure 1.



particular system labels itself 'comprehensive' or 'selective'. Germany, for example, has a formal and highly selective system which channels most students into different ability schools at about the age of 10 (Box 2). The US public education system, by contrast, operates a comprehensive system under which students of all abilities attend high schools of the same category. But as Figure 4 shows, these two very different systems produce very similar levels of relative educational disadvantage.

Nonetheless it is clear that *between-school* variance in educational performance is markedly higher in some countries than in others. The variation in PISA reading scores between different schools is less than one sixth of total variation in Iceland, Norway, Sweden, Finland and New Zealand. But between-school variation is very much more significant – accounting for more than half of total variation – in Greece, the Czech Republic, Mexico, Italy, Germany, Belgium, Austria, Poland, and Hungary.[12] Unfortunately it is not possible to relate these variations to differences in educational systems, mainly because each nation's system is different and because it is usually not possible to distinguish school quality from the effects of selective intake (whether explicit or implicit).

The immigrant factor

It is however possible to use recent cross-national data to illuminate one of the most commonly suggested explanations of national standings in education.

Plausibly, students who were not born in their country of education, or whose parents are immigrants, face a steeper educational path. Might it not therefore also be true that countries with a high proportion of such children are likely to find themselves lower down the education league tables?

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Germany: children sorted for life

How fair are decisions of the German school selection system? Most OECD countries have secondary schools that differ in the type of education they provide to children – general, vocational, technical and so on. But Germany stands out from the rest of these countries in two ways. First, the sorting of children into different school tracks happens at a notably early age: around ten. This is a feature shared only with Austria. Second, the hierarchical structure of the German educational system and the importance of particular qualifications in the German labour market mean that the track a child ends up in has a particularly strong impact on later life.

Schools – and their consequences

There are three main forms of state secondary education in Germany, all free of charge, each taking around a quarter to a third of children finishing primary school. The Gymnasium provides the most academic form of education and these schools have a near monopoly on the Abitur examination that allows university entry. Realschule traditionally leads to white-collar training and jobs. Hauptschule has the lowest status and yields the fewest options for further education – this school type is the standard route to blue-collar work.

Few children change track after the initial sorting that follows primary school. Hence the decisions made at age ten are of enormous importance.

One recent study showed wages of people who have been to a Gymnasium to be 63 per cent higher on average than those of people who had been to a Hauptschule and 28 per cent higher for those who had been to a Realschule. This may in part reflect higher innate ability of pupils who go to the more demanding forms of school. But it also reflects the advantages that those educational tracks confer, the most important being access to particular forms of further education (which boosts occupational status as well as earnings).

Overlapping abilities

If the sorting sends the ablest children to the Gymnasium, the next most able to Realschule and the least able to the Hauptschule, then surely the process is fair – provided one ignores the issue of how ability at the end of primary school has come about and possibility of 'catch-up' in the following years?

The chart shows the distribution of achievement among eighth grade German children in the TIMSS maths test in each of the three main school types, a test taken four years after leaving primary school. On average, the children at a Gymnasium score well above those at a Realschule, who in turn do much better on average than children at a Hauptschule. Looking at the average scores alone, the sorting seems to have worked well.

But the distribution of scores tells another story. There are many children at a Realschule who are as good or better at maths as some children at a Gymnasium, and the same even applies to a minority of the Hauptschule children as well. One in ten of Hauptschule children and a third of Realschule children score better than the bottom quarter of Gymnasium children. A third of Hauptschule children score better than the bottom quarter of children in a Realschule. There are large numbers of children in one type of school who would not be out of place in another type that offers better future prospects. This is the picture just for maths but a similar pattern is observed for the TIMSS science scores as well.

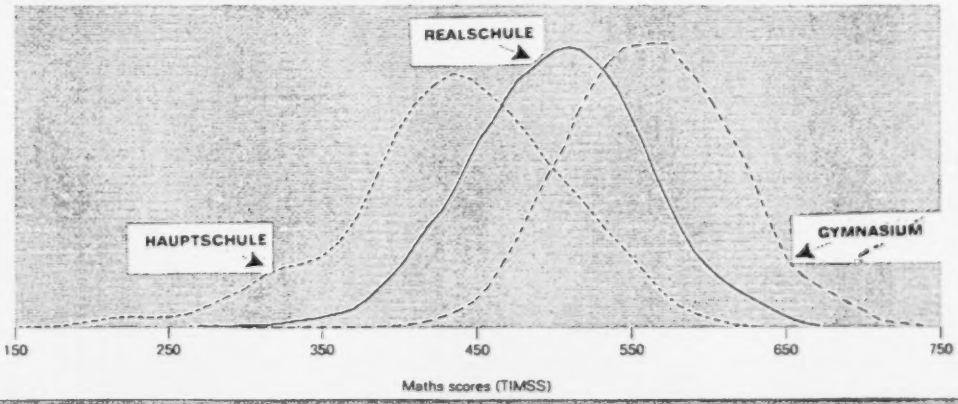
The sorting process

How does the sorting work? The main element is the formal recommendation for each child made by his or her primary school.

In most regions (Lander), parents are able to choose a school track that

Maths achievement by type of school (TIMSS)

The line on the left shows the distribution of 8th-grade maths scores for students in Hauptschule, the line in the middle for students in Realschule and the line on the right for students in Gymnasium.



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differs from the one recommended, although this may involve extensive lobbying. In some regions, parents are only entitled to question the initial recommendation with the final decision being taken by the region's educational authorities.

Better-educated parents can be expected to push for recommendations to lower school tracks to be put aside. Lesser-educated parents sometimes do the opposite. A 1996 study of Rhineland-Palatinate showed almost a third of children who were recommended to go to a Gymnasium did *not* do so if their parents had been to a Hauptschule, compared to only 1 in 10 when the parents had been to a Gymnasium. Six months before the sorting took place, three-quarters of Gymnasium educated parents expressed the wish that their children should go to this type of school, compared to only 40 per cent of parents who had been to a Realschule and fewer than 1 in 5 of those who had been at a Hauptschule. The early age at which sorting occurs in Germany heightens the impact of parents' views on their children's futures.

A large study of Hamburg found that parental education also has an impact on the primary school recommendations, with children from less educated families having to show higher ability than their peers in order to be recommended for a Gymnasium. And in a more fundamental sense, the recommendations are certainly influenced by family background since achievement while in primary school is clearly related to socio-economic factors.

All these different channels for the influence of parental background mean that the overall impact of intergenerational transmission of educational advantage in the German school system is huge: during the 1990s three-quarters of children of the relevant age with parents holding the Abitur also successfully completed this exam, compared to only a quarter where parents did not have it.

Source: see page 35

Figure 11 explores this proposition. The first column lists 23 OECD countries according to the percentage of non-native and first generation students in each nation's school system. The second and third columns then show the failure rate (defined as falling below Level 2 on the PISA reading literacy scale) for children who are and are not immigrant and first generation students. In every case except Ireland, the table reveals a higher failure rate for non-native and first-generation children. And in some nations the gap is extremely wide. For six countries, the percentage of non-native and first-generation children failing to reach Level 2 PISA reading literacy is 25 percentage points higher than for other children. And in five countries, the percentage failing to reach that benchmark is more than three times higher than for non-immigrant children.

Figure 11 Absolute disadvantage in reading and migration status (PISA)

The table shows the percentage of children in each country who are non-native or first generation, together with the percentage with low reading literacy scores in this group and the percentage among other children. Non-native and first-generation children have parents who were not born in the country. The basis for the ranking is the share of all students who are non-native or first-generation.

	Share of non-native and first-generation children (%)	15 year-olds at or below PISA reading literacy level 1	
		Non-native and first-generation children (%)	Other children (%)
JAPAN	0.1	14.4	8.1
ICELAND	0.8	35.7	13.8
ITALY	0.9	33.3	17.8
CZECH REPUBLIC	1.0	34.2	13.2
FINLAND	1.2	28.6	6.1
HUNGARY	1.7	23.0	22.2
SPAIN	2.0	30.6	15.3
IRELAND	2.3	6.5	10.4
PORTUGAL	3.1	31.0	25.2
NORWAY	4.6	31.4	16.0
GREECE	4.8	48.5	22.7
DENMARK	6.1	43.5	14.9
UK	8.3	29.9	19.9
AUSTRIA	9.7	40.0	11.1
SWEDEN	10.5	29.3	10.1
FRANCE	12.0	26.5	12.5
BELGIUM	12.0	45.8	13.8
USA	13.6	27.7	15.4
GERMANY	15.2	44.3	14.2
NEW ZEALAND	19.6	19.7	18.5
SWITZERLAND	20.5	44.2	13.1
CANADA	20.5	12.2	8.0
AUSTRALIA	22.5	14.5	11.5

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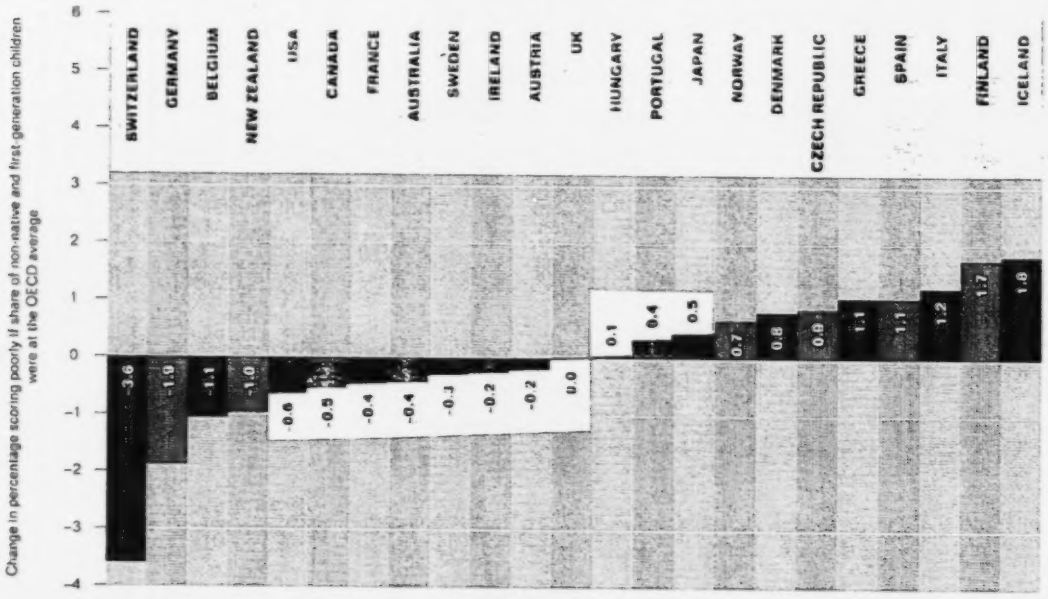
Figure 12 What if all countries had the same proportion of non-native or first generation children?

The bars show the change that would occur in the percentage of 15 year-olds at or below PISA reading literacy level 1 if the share of non-native and first-generation children were at the OECD average (9 per cent) in each country.



So does this 'immigrant factor' help to explain the national standings in education league tables?

Figure 12 shows how the percentage failing to reach Level 2 literacy would change if all OECD countries had the *same* proportion of non-native or first generation children as the average for the OECD as a whole (assuming that in each nation the current performance gap between such children and other children still prevailed). The outcome of this exercise is striking: in most countries the change is less than one percentage point. So small are the changes that a league table of educational performance such as that shown in Figure 2a would hardly be affected at all. There would be virtually no change, for example, in the rank order of the top eight countries (although the situation in Korea, cannot be assessed due to a lack of data). Some changes in position would occur in the middle and lower reaches of the table, but they would be small, with only Switzerland making substantial gains.

In sum, the immigrant factor has only a marginal effect. The proportion of non-native or first generation children, weighted by their poorer average performance in standard tests, is simply not a powerful enough factor to re-write the order of countries in the OECD league tables of educational disadvantage.

Useful as these cross-national data are in addressing one of the commonly advanced explanations for national standings, it should be remembered that immigrants are not the same in all countries: they may be of different origin, have different migration histories, and be confronted by different degrees of linguistic, cultural, and economic disadvantage. Nonetheless Figure 11 remains valuable not least as a measure of the challenge faced by every OECD country in ensuring that minority groups, including non-native and first-generation pupils, receive the support they clearly need in order to overcome the particular disadvantages they face.

Best and worst

In sum, the 'big picture' shows that some OECD countries are consistently performing better than others when it comes to educating and equipping their young people for life in the 21st century – whether measured by the percentage of students reaching fixed benchmarks of competence or by the gaps that are permitted to open up between low-achieving and average students.

Combining the results of recent cross-national research, it can be said, for example, that a child now at school in Finland, Canada or Korea has a significantly higher chance of being educated to a reasonable standard, and a significantly lower chance of falling well behind the average educational level for

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his or her age, than a child born in Hungary, Denmark, Greece, the United States or Germany.

Current knowledge does not point a precise finger at the factors or policies which account for these differences in educational outcomes. But one clear finding is that differences in educational achievement *within* nations are very much greater than differences *between* nations. Different national policies and systems may promote or mitigate disadvantage in ways that are not fully understood, but they are clearly not the mainspring of that disadvantage.

It is therefore to the question of the relationship between educational performance and pre-existing inequalities in society at large that this report now turns.

Home background

It has long been known that the chances of success at school are heavily influenced by circumstances at home – and in particular by parental education, occupation, and economic status (though there is some evidence that cultural resources may be even more important than economic resources).

Figure 13 draws on data from the United Kingdom to show a striking relationship between home advantage and school achievement. Using eligibility for free school meals as a proxy for economic status, the chart shows that schools with a high proportion of students from economically disadvantaged homes also have significantly poorer examination results. Indeed students at the bottom of the achievement range in schools where 95 per cent or more of students come from more affluent backgrounds are seen to have better examination results than even the best performing

Attainment versus achievement

This *Report Card* focuses on educational achievement – children's ability to apply what they have learned. But how do the results of the achievement surveys used in this report compare with more traditional indicators of educational *attainment* that simply show the proportion of the population who have completed a given level of education?

The graph shows the situation for the European Union, comparing the percentage of 18 to 24 year-olds not in education or training and with only lower secondary qualifications – the educational indicator for young people preferred by the European Commission – to the percentage of 15 year-olds with low reading achievement in the recent PISA study.

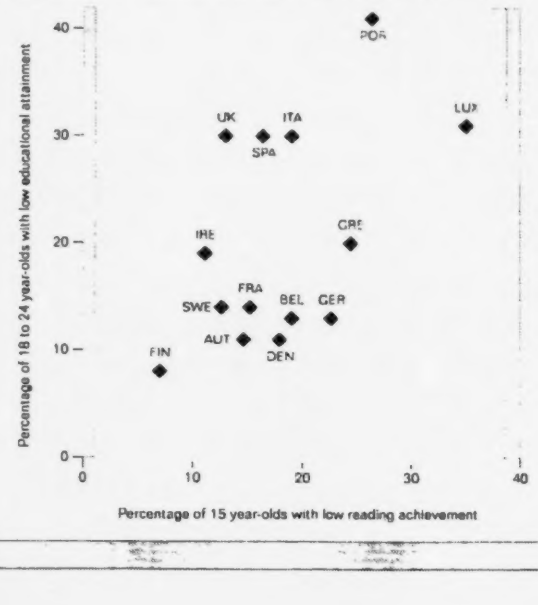
In general, countries that do well on one indicator also do well on the other. Finland is an obvious example: less than 10 per cent of young people with low attainment and less than 10 per cent of 15 year-olds with low reading levels. Portugal is another, ranking last on the attainment indicator and next to last on achievement.

On the other hand, the association between the two is far from perfect. The UK stands out as a country doing better on achievement – as measured by reading in PISA – than on attainment. And the percentage of young people with low attainment in the UK would be even higher if the figures included those who leave school at 16 after success in public exams taken at that age that do not permit entry to university. As this underlines, definitions in the field of educational statistics are difficult to standardise across countries, adding value to the international achievement surveys that overcome this problem.

Even with the definition taken, the UK records 30 per cent of 18 to 24 year-olds failing to achieve upper secondary qualifications and the same is true for Italy, Luxembourg and Spain, with the figure even higher for Portugal. These are young people at a major disadvantage in their countries. And as with the achievement data, much research shows that lower attainment in OECD countries is strongly linked to family background.

Comparing attainment with achievement

The figure shows the percentage of 18 to 24 year-olds not in education or training that have completed at best only lower secondary education against the percentage of 15 year-olds at or below the PISA reading literacy level 1.



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students in schools drawing half or more of their intake from economically disadvantaged homes.

Or to take another example, Irish children whose parents are high-earning professionals have a 90 per cent chance of progressing to further education – as opposed to a 13 per cent chance for children whose parents are in unskilled manual occupations.[13] Similarly, German children whose parents have some tertiary education are significantly more likely to attend a *Gymnasium* (the most prestigious form of secondary education that tends to monopolise entrance to Germany's universities (Box 2)).[14]

But whereas almost all OECD countries could provide similar examples of home background influencing children's educational achievements, recent cross-national data show that the extent of that influence varies considerably between countries. (PISA, in particular, has made a major contribution to research in this field by collecting internationally standardised data on the social and economic background of participating students.)

Figure 14, for example, takes 26 OECD countries and compares the educational achievements of those students whose mothers have and have not completed upper secondary education. And it shows that in Germany or Mexico the children of less educated mothers are three to four times more likely to perform poorly in reading literacy. At the other end of the scale, students educated in Finland, Ireland, Poland, Iceland, Norway or Sweden are only about one and a half times more likely to be in the bottom 25 per cent for reading literacy if their mothers did not complete upper secondary education.

Or to take yet another measure, Figure 15 relates the probability of poor performance in maths to whether pupils have few or many books in their homes (a proxy for social and economic status which attempts to include culture and attitudes towards education in a way that income measures alone might not). And again it can be seen that home background, as so measured, is strongly related to school performance though again that relationship varies from country to country.[15]

Breeding advantage

Such linkages have been well documented in most nations. And research and common sense have suggested some of the principal pathways by which more privileged backgrounds lead to enhanced chances of success in school.

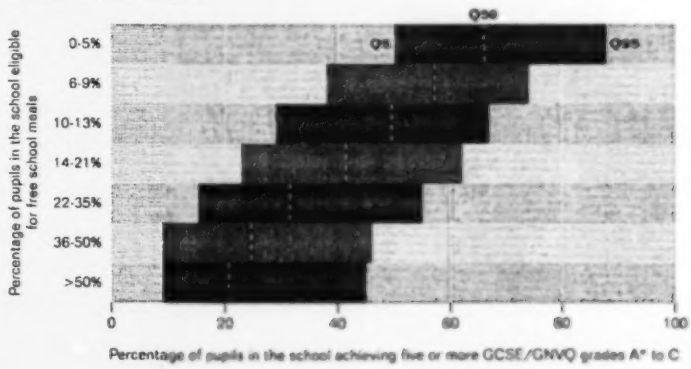
It is possible, for example, that the advantages of having more educated parents begin with genetic privilege. It is also possible that better maternal health in pregnancy can benefit brain growth in the unborn child. Thereafter, the benefits become visible – more resources in the home, probably fewer children in the family, possibly more knowledge of the importance of early childhood development, and perhaps more time to devote to the vital processes of reading, talking, and listening to infants and young children. All of this tends to translate into a maximising of genetic potential and a laying down of the foundations for social and cognitive skills.

But long before compulsory education begins, a child from a more privileged background is also more likely to be the beneficiary of high-quality child care in kindergarten or pre-school. This too helps prepare the ground for future educational success.

When formal schooling begins at the age of four to six years, social and economic advantage again translates into the greater likelihood of attending a better school. Even in cases where better-off parents do not opt for private education, selection is still a possibility through relocation to areas where schools have better reputations and better examination results, or through the ability to provide transport to such schools. More generally, parents who are themselves better-educated and in well-paid jobs are

Figure 13 Exam success at age 16 and free school meals (English schools).

The graph shows the association between exam success in schools (percentage of pupils achieving five or more GCSE/GNVQ-equivalent exam passes at grades A* to C in 2001) and the schools' levels of social disadvantage (measured by the percentage of pupils in the school known to be eligible for free school meals). The data exclude private schools and selective state-sector schools. The bars extend from the 5th to the 95th percentiles in each category. The lines approximately at the middle of each bar correspond to the median.



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often also more experienced and confident in information-gathering and decision-taking.

Once enrolled, children from more privileged backgrounds may then benefit from higher standards of health and nutrition, fewer days off school, higher teacher expectations, better discipline, greater peer and parental pressure to do homework and pass examinations and more school resources as a result of better fund-raising opportunities. In addition, they may also benefit from better teaching as many teachers prefer to work in schools where social problems are fewer, disciplinary standards higher, and pupils more receptive.

It is as a result of such processes that children from more privileged backgrounds tend to progress further and faster in education. And so powerful and persistent is this tendency that it is able to sustain a similar pattern of educational inequality in all OECD countries despite the many differences in educational systems and policies. Across the industrialized world, a family's social, cultural and economic status tends to act as a rifle-barrel setting an educational trajectory from which it is difficult for a child to escape.

There are of course many exceptions; many millions of individuals do escape that trajectory and, without any particular initial advantages, achieve educational success at the highest levels. But the fact remains that the processes described above, though varying with the contours of each society, tend to ensure that educational advantage and disadvantage reproduce themselves from one generation to the next. The race is not always to the swift nor the fight to the strong; but that's still the way to bet.

Figure 14 Low reading achievement and mother's education (PISA)

The bars show the probability of scoring in the bottom quarter of the national reading literacy distribution if the child's mother did not complete upper secondary education relative to the probability if the mother did complete this level of education. The numbers at the right hand side of the graph give the percentage of mothers who did not finish upper secondary schooling. Japan is not included due to a high proportion of missing data.

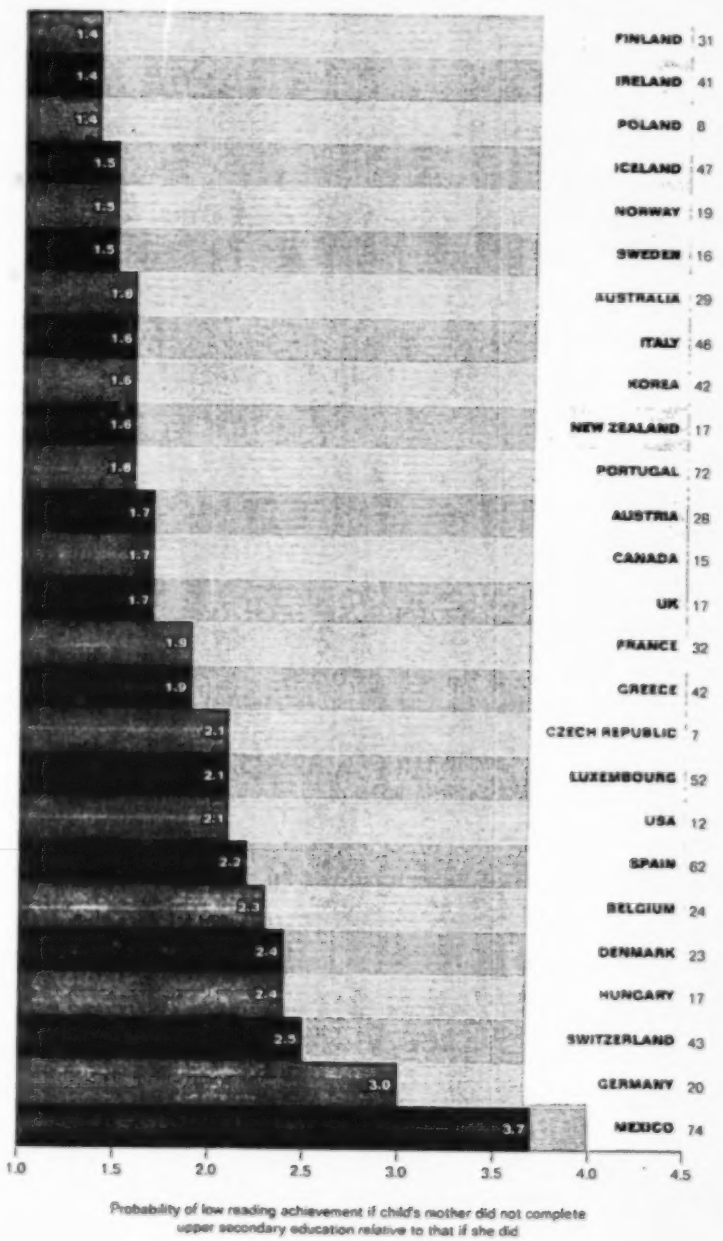

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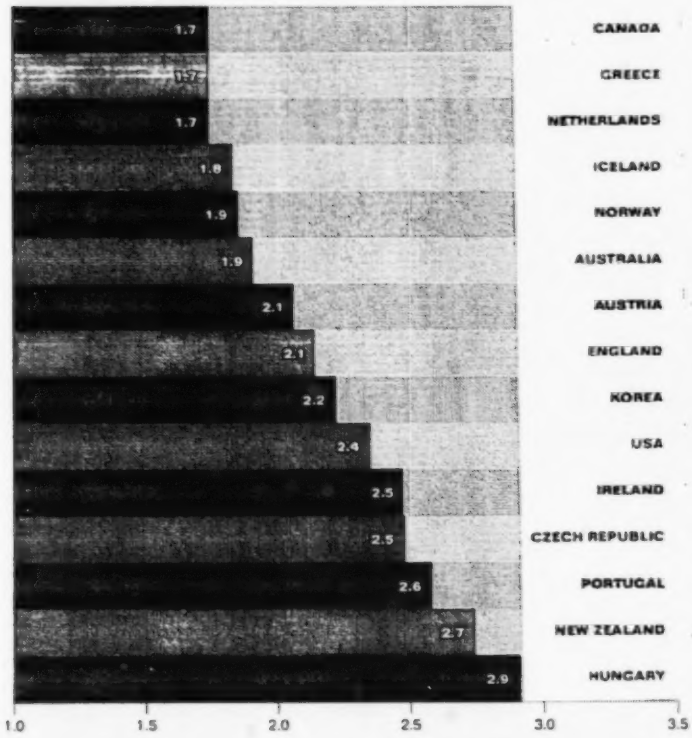
Figure 15 Low maths achievement and the number of books at home (3rd graders in TIMSS)
The bars show the probability of scoring in the bottom quarter of the national maths achievement distribution in grade 3 if the child's home has few books (25 or less) relative to the probability if it has many (26 or more).



Residual inequality

Governments of all OECD countries remain committed to the principle of equality of opportunity, and to the practical goal of allowing each child to reach his or her full educational potential. In this context, it is clearly unacceptable that the social and economic status into which a child happens to be born should so profoundly influence his or her chances of success in school.

In the not so distant past, it was possible to believe that the provision of free compulsory education through secondary school, and the opening up of higher education to all on the basis of merit, would carry nations far down the road towards equality of opportunity. And it should not be forgotten that such policies have indeed transformed societies in which, only three or four generations ago, access to secondary education of any kind was restricted to an élite.

Nonetheless as the twenty first century begins, all OECD nations continue to show significant inequalities in educational outcomes – inequalities that are clearly related to family background. And with the possible exceptions of Sweden and the Netherlands, such inequalities appear to have diminished little in recent decades.[16]

It might be argued that there is little to be done about this, that efforts to create equality of opportunity have now run their course, that some students will always do better than others, and that we have now reached a bed-rock of residual inequality that merely reflects the natural distribution of ability in society. But this argument cannot explain why some countries have a higher percentage of lower-achieving students, or why low-achievers in some countries are so much further behind the average level of achievement than in others. A graph of the distribution of test scores in reading or in mathematical ability may well resemble the familiar bell-curve of inequality, but clearly there are other forces at work that can alter the shape of that curve. And even if current knowledge does not allow those forces to be identified with sufficient precision, it is clear that in most nations there is still considerable scope for reducing educational disadvantage – perhaps by directing more resources towards deprived areas, or by offering incentives to bring the best teachers into the most disadvantaged schools. As many educationalists have argued, *"Schools can serve to reduce or challenge existing social inequality."*[17]

Learning from birth

But precisely because it is clear that the social, economic and cultural status of the child's home is the most powerful influence on the likelihood of educational success, much recent research has focused on that relationship and on the possibilities for weakening the processes by which disadvantage is reproduced from one generation to the next. And perhaps the most significant of the insights gained in recent decades has been the realisation that such disadvantage becomes established, and

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measurable, at a much earlier age than was previously suspected.

Figure 16, for example, draws on TIMSS evidence from Canada to show that not only are differences in test scores between students in any one year many times greater than the difference between years, but that this is already true as early as the 3rd grade; even by age nine the difference in maths between high and low achievers is already seen to be four times greater than the expected increase in score between grades 3 and 4.

Furthermore, international comparison of levels of inequality at different ages reveals that, with the exception of Portugal, the countries with the most inequality among 14 year-olds tend also to be the countries with the most inequality

Figure 16 Maths achievement in 3rd and 4th grades in Canada (TIMSS)

The dotted line shows the distribution of maths scores in 3rd grade, while the continuous line shows the distribution in 4th grade. The long arrow shows the distance between the 5th and 95th percentiles (in 3rd grade), while the short arrow shows the distance between 3rd and 4th grade (at the 5th percentile).

Sweden: reform reduces inequality

4

Sweden used to have a system of early sorting after six years of primary education. Selection into junior secondary school was on the basis of ability and those children who did not make the cut – or whose parents would not permit them to go – had only one or two more years of compulsory education (depending on the municipality). In 1949, this applied to two-thirds of all children.

In 1950 Sweden decided on a reform designed to increase education for children from unskilled family backgrounds and to promote movement on up through the educational system. All children would have nine years of compulsory education in comprehensive schools and all children who successfully completed would qualify for secondary education.

The reform was not fully introduced until 1962. During the intervening years, a nationwide experiment was conducted with the new system, representative samples of municipalities being chosen to implement the reform. The impact of the changes can be deduced through comparison of children affected by the new rules during this experiment with those of the same age whose education continued under the old system.

As intended, the impact of the reform was greatest for children from unskilled backgrounds. Among boys born in 1948, the share of low ability children in unskilled families who stayed on in school after the (now longer) compulsory period went up by about five percentage points. A four percentage point increase was found for high ability girls in unskilled families. This cohort's annual earnings during 1985 to 1996 rose most for those who had been the able children from unskilled backgrounds – by about 6 per cent on average for both men and women.

Source: see page 35

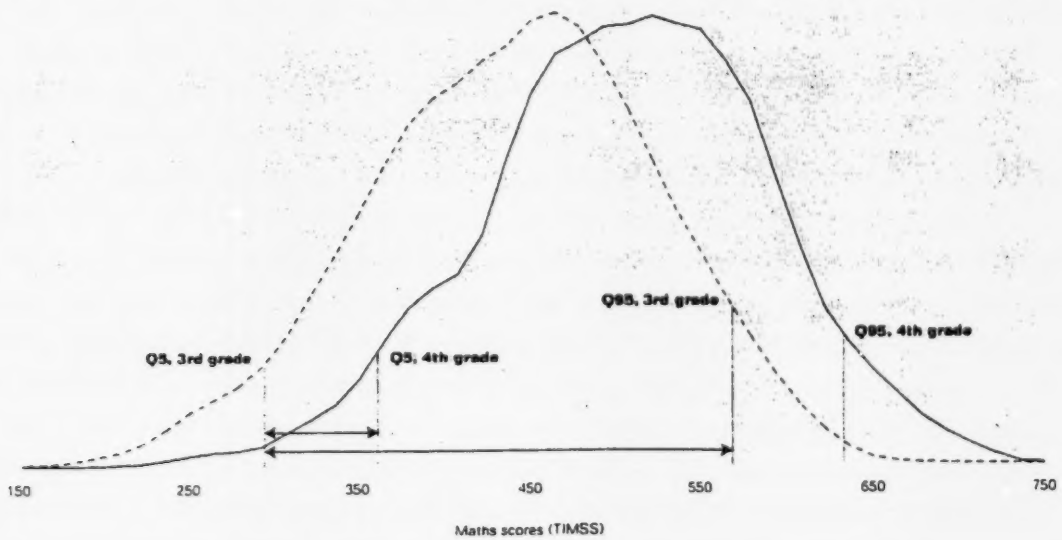

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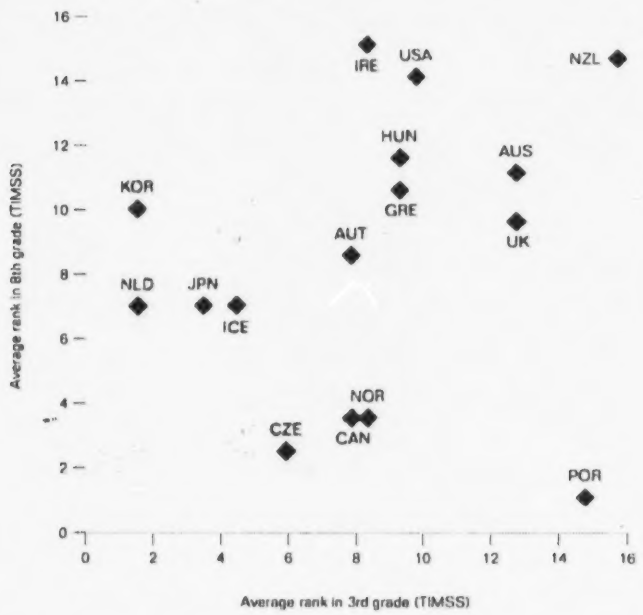
Figure 17 Relative educational disadvantage in 3rd and 8th grades (TIMSS)

The chart shows the average rank in relative disadvantage in TIMSS maths and science tests in two school grades, the 3rd (mainly 9 year-olds) and the 8th (mainly 14 year-olds). Relative disadvantage is measured by the difference between the 5th and 50th percentiles. The chart is restricted to the 16 OECD countries which participated in TIMSS 1995. The outer limits of the darker-shaded band are parallel to a regression line estimated for all countries except Portugal.



among 9 year-olds. It appears, therefore, that what happens in school between the 3rd and 8th grades does not have a very great effect on the standing of nations in the league table of 'bottom end' educational inequality (Figure 17).

But given the acknowledged importance of home background, might such differences be established even before the monitoring of school performance and the ability-testing of whole generations of children can begin?

Measuring and comparing children's learning abilities in the years before formal schooling begins is a more difficult proposition. But not an impossible one. In one pioneering study, a cohort of almost 1300 children born in the United Kingdom in the year 1970 were tested at 22 months and 42 months (using specially-devised, age-suitable tests) and again during their school careers at the ages of 5 and 10 years. The subsequent educational records of those children were then monitored up to the age of 26 years. And among many striking results was the finding that children who ranked in the top 25 per cent on the ability scale as measured at 22 months were three times more likely to gain advanced educational qualifications.[18]

Reinforcing and partially explaining such findings, recent advances in neuroscience have shown that the earliest months and years are the time when the brain develops most rapidly, laying down patterns and templates for future competence and coping skills. Learning is now known to be a process that begins at birth and can be catalysed or inhibited by the earliest interactions and experiences.

Clearly, all of these findings suggest that attempts to mitigate educational disadvantage need to begin even before a child starts school.

Early childhood care

All of this has fuelled a steadily rising interest in early childhood development and in ways and means of giving children the best possible educational start. And whereas many governments have been slower to respond to this challenge than parents and publishers, a majority of OECD nations have now made policy commitments to early childhood education.

In part, increasing government involvement is a response to new knowledge and an apparent opportunity to break into the cycle by which disadvantage tends to reproduce itself. In part, also, it may be motivated by long term economic and social concerns; no nation today can afford to ignore opportunities for maximising investments in education in a competitive economic environment increasingly based on knowledge, flexibility, and lifelong learning skills.

But there is a third and more immediately pragmatic factor pushing governments into the arena of early childhood education. Social, demographic, and economic change over recent decades – including the increasing participation of women in the paid workforce, the greater mobility of labour, the steady reduction in average family size, and the rise of the single-parent family – has created a widespread parental demand for child care in the years before compulsory schooling begins. As the OECD has noted, *"In*

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many countries the care and education of young children is shifting from the private to the public domain."[19]

At the same time, it has become clear that if being looked after by others is to play a significant part in the child's pre-school experience, then care and education should not be separated. If, over any significant period of time, a child is not involved in activities that help stimulate and develop the brain, then that child is being less than adequately cared for.

For this reason, the OECD prefers 'early childhood education and care' (ECEC) and this is the term used in the OECD's twelve-nation review of the subject published in 2001 under the title *'Starting Strong.'*[20]

In several of the OECD countries participating in this review, access to ECEC is now a statutory right for all children from age three. And the review finds that everywhere, *"the clear trend is towards full coverage of three to six year-olds,"* implying at least two years of free, publicly-funded care and education before the beginning of compulsory schooling. *'Starting Strong'* also finds an OECD-wide movement towards higher levels of training for ECEC staff and, in some nations, an insistence on a three year degree course for those carrying mainstream responsibilities for pre-school children. Despite such trends, the OECD finds what it calls *"differential access"* to high quality ECEC and *"a tendency for children from low-income families to receive inferior service."*

A full discussion of ECEC and of the findings of the OECD's first cross-national inquiry into the subject lies outside the scope of this *Report Card*. The broad conclusion reached is that, although most children in OECD countries now spend two years or more in pre-school care and education,[21] provision of ECEC services is uneven in quality, purpose, access, evaluation, degree of cooperation with schools, participation of families, and staff-training. It also finds ECEC to be too often a fragmented and shifting service in which staff and children make numerous transitions at a time when stability and continuity would be in the best interests of the child.

Does it work?

ECEC serves many needs, including the needs of labour markets and of parents wishing to reconcile the demands of earning a living with the demands of bearing and caring for children. But the aspect of ECEC that is of particular concern here is its potential to mitigate educational disadvantage.

That potential is the basis of many ECEC programmes that are specifically targeted towards children from disadvantaged backgrounds. One of the longest-established is the US *Head Start* programme launched in the mid 1960s as part of President Johnson's 'War on Poverty'. One of the newest is the UK *Sure Start* programme launched in 1998/9 as part of the Labour government's stated aim of *"breaking the cycle of disadvantage"* and eradicating child poverty by 2020. Similar government programmes, varying in scale and ambition, are to be found in many OECD nations.

But whereas the purpose and theoretical basis of such programmes is clear, is there any evidence that they actually work?

The answer at this point is by no means obvious.

In part, this reflects the relative newness of many ECEC initiatives, the lack of rigorous evaluation of longer-running programmes, and the logistical difficulties of measuring impact over a period of years or even decades in societies in which there are many rapidly changing variables. Such evaluations are especially difficult in large-scale programmes which attempt to reach all disadvantaged children and therefore have no control group of similar children who do not participate and with whom participating children may be compared over a period of years.

The largest and best documented of such initiatives is *Head Start* which currently employs 180,000 staff, provides education and care to almost one million disadvantaged pre-school American children, and costs approximately US$6 billion a year. But despite its long history, controversy still surrounds *Head Start's* real achievements, with critics claiming that the outcomes are overstated and proponents claiming that the inputs are under-funded. Overall, the consensus of current opinion seems to be that the programme has achieved much whilst not delivering the kind of measurable, clear-cut successes that had initially been hoped for.[22]

Meanwhile, research into smaller-scale examples of ECEC suggests that it can indeed reduce educational disadvantage. But the evidence tends, in the main, to be drawn from pilot studies of higher-quality and more resource-intensive ECEC programmes. In particular, the Californian Abecedarian and Perry Pre-School projects in the United States have shown that significant and lasting gains can be achieved.[23] These projects have been rigorously evaluated by comparing outcomes for disadvantaged children who had participated in the programme with comparable groups of children who had not. In both cases, the children involved have now reached adulthood, and although the studies are often based on very small samples (59 participants and 65 controls in the Perry Pre-school project) the degree of impact appears

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Maths achievement beyond the OECD

What is the learning achievement of children in countries outside the OECD? One of the attractions of TIMSS is its coverage of a substantial number of countries from all parts of the world. The 25 non-OECD countries that took part in 1995 or 1999 include concentrations from Central and Eastern Europe and from East Asia and a variety from North Africa and the Middle East. Data have been collected in countries as diverse as Russia, Iran, Israel, South Africa, Indonesia and Chile.

The large graph shows the percentage of eighth grade children in each country scoring below a level judged by the survey organisers to show "ability to apply basic mathematical knowledge in straightforward situations." This is the measure from TIMSS that enters the index of *absolute* educational disadvantage in Figure 1.

Singapore, Hong Kong and Taiwan join OECD member countries Korea and Japan at the top of the table in a notable grouping. Slovenia, the richest of the former communist countries in Central and Eastern Europe, is the next non-OECD country in the ranking, just ahead of much poorer Russia, which in turn is well ahead of a range of large OECD countries including the United States, the UK, Spain and Italy. (Several of the former communist countries score well in the TIMSS science tests too, although their PISA results are typically less impressive.)

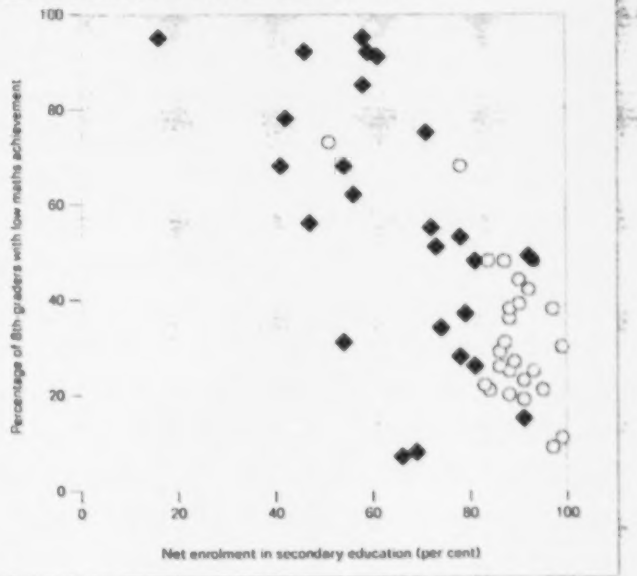
In general however, the OECD members out-perform most of the other countries. (Portugal and Turkey stand out as exceptions to this rule.) Among the latter, in 15 of the 25 cases the majority of eighth grade children are below the benchmark. The non-OECD countries are poorer on average and their lower level of development is reflected in their lower levels of maths achievement.

Countries at lower levels of development also have lower enrolment rates. Whereas virtually all children are in school during eighth grade in the rich OECD countries, the same is not true for example in South Africa or Morocco - at the bottom of the table.

The TIMSS results refer only to those children *in school*. The smaller graph plots the TIMSS results against secondary school enrolment rates. (These rates refer to *all* secondary years and not just the eighth grade.) Lower achievement and lower enrolment tend to go hand in hand. The challenge for national policy makers and the international community is both to raise the numbers of children in school and to improve the learning of children when they are there.

Absolute disadvantage in maths (TIMSS) and enrolment rates

The figure shows the percentage of 8th-graders not reaching the median of maths achievement of all children in all countries included in TIMSS 1999 against net enrolment rates in secondary education. Empty circles are OECD countries and dark diamonds are non-OECD countries.



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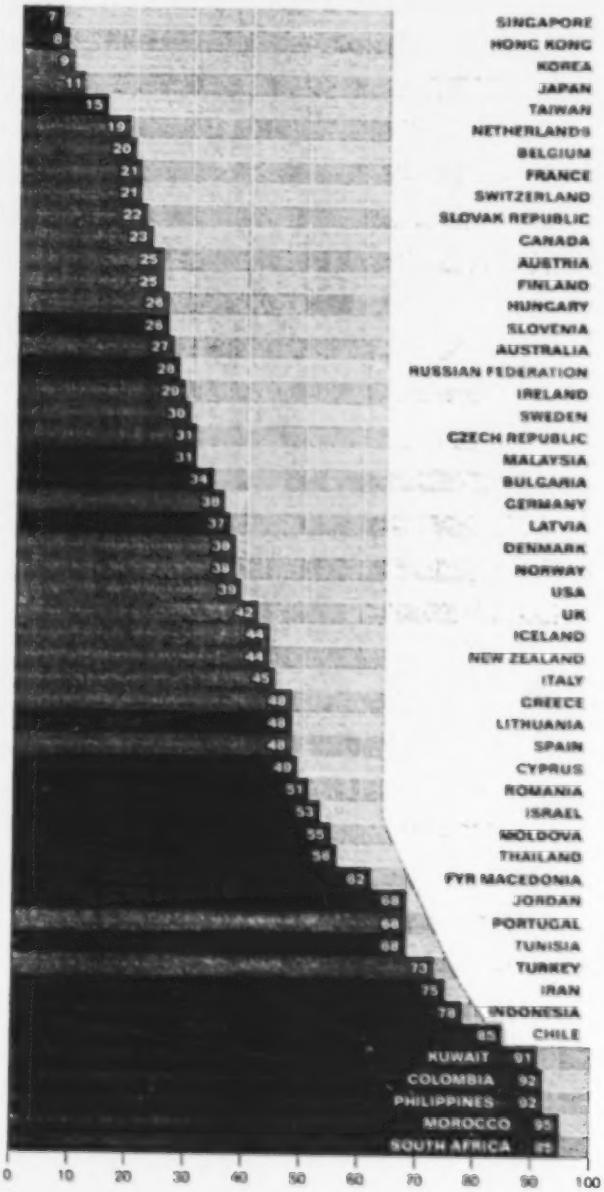
5

Absolute disadvantage in maths in OECD and non-OECD countries (TIMSS)

The table shows the percentage of 8th-graders not reaching a fixed international benchmark of maths achievement (defined as the median of maths achievement of all children in all countries included in TIMSS 1999). Light bars are OECD countries while dark bars are non-OECD countries.



extraordinary. Perry Pre-school children, for example, were found to be one third more likely to have graduated from high-school, 50 per cent more likely to be employed or in post-secondary education, 50 per cent less likely to have had a teenage pregnancy, and 40 per cent less likely to have been arrested.[24]

These are dramatic gains, and have fuelled hopes that early childhood education and care may offer one way forward not only against educational disadvantage but against other important social problems facing disadvantaged children and the societies in which they live.

Quality the key

In addition to the narrowness of the current evidence base, optimism about the potential of ECEC must also be tempered by the fact that significant and sustained success seems only to have been achieved by small, high-cost programmes. Repeating such success on the grand scale is a different proposition. First, it would clearly involve major increases in funding. Second, it is notoriously difficult to replicate on a nation-wide scale the high levels of motivation, commitment, staff-quality, and determination to succeed which so often characterise smaller scale, pioneering, non-governmental programmes.

In sum, the evidence to date suggests that the potential of ECEC can only be liberated by *quality* ECEC. And as the OECD's cross-national review concludes, 'quality' implies a well-informed and clear vision of purpose and aims, strong partnerships with both families and primary school systems, well thought out access policies to enable all children at risk to participate, high standards of staffing, motivation, and in-service training, and a built-in, long-term agenda for research and evaluation.

Ultimately, it seems clear that the quality and effectiveness of ECEC programmes

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depends on one crucial characteristic that is difficult to define and quantify and even more difficult to deliver on the necessary scale. The OECD's own review describes this crucial element as *"a stimulating, warm and supportive interaction with children."*[25] And in strikingly similar language, a review of ECEC in the United States concludes that *"warm, sensitive and responsive interaction between caregiver and child is considered the cornerstone of quality."*[26]

In other words, good early childhood care is something which most parents in a position to do so already provide for their children, but which institutions and governments will struggle to replicate.

Public investment

But the challenge cannot now be ducked. Firstly, because care outside the home in the two years or so before primary school is today a fact of life for a majority of children growing up in OECD countries.[28] Secondly, it is possible that publicly-funded ECEC may have an increasing role to play in minimising educational disadvantage and social exclusion. Evidence from the United States suggests that publicly-funded high-quality ECEC reserves its greatest benefits for the disadvantaged.[27] This is hardly a surprising finding, given that more advantaged children are likely to be already receiving quality child care. But it is nonetheless a crucial point. Mitigating educational disadvantage depends on identifying powerful interventions which benefit the disadvantaged more than the advantaged. High-quality, publicly-funded ECEC appears to be such an intervention.

But, all other things being equal, it is likely that this opportunity to strengthen the foundations of learning will again be more fully exploited by better-off families.

This is of course already happening, and is the natural response of well-informed parents. But while parents cannot be criticised for acting in the best interests of their children, the fact remains that a special opportunity for mitigating the effects of social disadvantage may become yet another powerful mechanism by which pre-existing advantage perpetuates itself.

Only governments can ensure that the potential of ECEC is used to extend to all children the opportunity to reach their educational potential and to mitigate rather than exacerbate disadvantage. But this cannot be achieved by responding minimally to the growing work-force demand for pre-school care. The most important lesson to be learned to date is that only high quality services can fulfil the potential of early childhood education and care. It will therefore weigh heavily on the public purse.

A political opportunity

In many OECD countries, opportunities to mitigate social disadvantage via publicly funded programmes have fared less than well in recent times. But there are two reasons for thinking that public expenditure on high-quality early childhood care might find greater public favour.

The first is that ECEC holds out some hope of addressing at a fundamental level some of the economic and social problems which are of increasing concern to society as a whole. The second reason is that in all OECD countries there is already significant public demand for high-quality child care. In many cases this may have more to do with the needs of the labour market and of individual men and women looking to find ways of reconciling earning with parenting, but it nonetheless represents a clear political opportunity to advance the cause of universal access to publicly-funded, high-quality ECEC.

Sturdy economic, political, and social arguments can therefore be harnessed to the cause of quality ECEC. But the power of a principle might also be invoked. Progress towards greater equality of opportunity is one of the defining ideals of modern societies, and a common strand in their historical experience of which they may justly be proud. Extending the benefits of quality early childhood care and education to all children represents an important opportunity to carry that ideal forward. ■

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Notes

1 That educational disadvantage matters is an argument that has been made elsewhere. But to take one example, an increase of 50 points in test scores recorded under the International Adult Literacy Survey has been found to be associated with an increase in earnings of 9 per cent in Sweden, 12 per cent in Switzerland, 19 per cent in the Netherlands, 22 per cent in Canada, and 26 per cent in the USA (F.Blau and L.Kahn, 'Do Cognitive Test Scores Explain Higher US Wage Inequality?', NBER Working Paper 8210 (Table 2, no controls for education)). Similarly, the probability of being unemployed falls steeply with rising prose literacy scores in all nations for which data are available (OECD and Statistics Canada, *Literacy in the Information Age – Final Report of the International Adult Literacy Survey*, OECD, Paris, 2000, p.167). Less quantifiable but no less important is the concern, shared by most OECD governments, that those at the bottom of the scale of educational achievement are at greater risk of economic marginalisation and social exclusion.

2 *The Economist*, London, December 8th, 2001.

3 OECD, *Measuring Student Knowledge and Skills: A New Framework for Assessment*, OECD, Paris, 1999.

4 Although five different league tables of educational performance contribute to the average rank of each country, only two independent surveys are involved. The averaging of PISA and TIMSS rankings also gives PISA (three tests) more weight than TIMSS (two tests), and lends more weight to maths and science (two tests each) than to prose literacy (one test). TIMSS, however, tests knowledge of maths and science against an internationally agreed curriculum whereas PISA tests for mathematical and scientific 'literacy' – by which is meant the kind of mathematical and scientific skills needed to cope with daily life.

5 The league table presented here (***Figure 1***) is a very different construct from the league tables on which the last two *Report Cards* have been based. *Report Cards 2* and *3* presented, respectively, a league table of child deaths by injury and a league table of teenage birth rates. In both cases, the tables were based on total population data rather than on sample surveys, and in both cases what was being measured and compared was the recorded incidence of an actual event. The league table of educational disadvantage might therefore be thought of as a 'softer' league table than those presented in previous *Report Cards*. It nonetheless represents the most robust and reliable comparison to date of how well different societies are performing in the task of educating their young people for adult life.

6 It is also encouraging to note that an overall comparison of rankings in the individual PISA and TIMSS league tables shows that, despite the differences, the different approaches and

methods tend to produce broadly similar results. This buttresses the concept of averaging the individual league table rankings in order to arrive at a 'big picture' of overall educational performance. (If the different surveys produced wildly differing league tables then the averaging of ranks would tend to produce little variation, as a low rank in one league table would likely be balanced by a high rank in another so leaving all 24 countries clustered around an average rank of 12.)

7 Even then, sampling errors may mean that differences in league table rankings are not statistically significant (i.e. the margin of possible error caused by testing a sample rather than the complete student population may be greater than the observed differences between countries). However, detailed analysis of the data behind the PISA reading league table ***(Figure 2a)***, for example, shows that the difference between any two countries is statistically significant in more than three-quarters of all cases. On average, using a different sample of students would produce a change in ranking for each country of no more than one place in the league table. (See *Sources* for more details.)

8 Unfortunately, rankings for the individual PISA and TIMSS league tables of *relative* educational disadvantage are less robust than for *absolute* disadvantage (see *Sources*). This strengthens the case for averaging such rankings into the overview presented in ***Figure 4***. But it does not entirely overcome the problem. A country in the middle of the table may arrive at that position either by being consistently in or around the middle of the individual league tables or by riding very high in one table and very low in another. The significance of the league of *relative* educational disadvantage is therefore probably to be found towards the top and bottom ends of the table, as nations may only achieve a very high or very low average rank by scoring consistently well or consistently badly in the individual tables of *relative* educational disadvantage.

9 Sang Young Lee, Education Director, Korean Embassy, London, quoted in *Times Education Supplement*, 14th December 2001.

10. *Times Education Supplement*, 14th December 2001.

11 There is a large literature on the effect of class size (and other aspects of school resource inputs) on educational outcomes. An example of a recent paper that concludes that smaller class size does have a positive effect is J-W. Lee and R. Barro, 'Schooling quality in a cross-section of countries', *Economica*, vol. 68, pp.465-488. (Among other sources, the authors use TIMSS data in a cross-national regression framework.) An example of a review of the literature is A.Vignoles, R.Levacic, J. Walker, S. Machin and D. Reynolds, 'The relationship between resource allocation and pupil attainment; a review', Discussion Paper no. 2, Centre for the Economics of Education, London School of Economics, November 2000 (available from http://cee.lse.ac.uk/publications.htm).

12 OECD, *Knowledge and Skills for Life – First Results from PISA 2000*, OECD, paris, 2001 (Annex B1 Table 2.4 p. 257).

13 E. Smyth and B. McCabe, 'The educational situation of disadvantaged children' in I. Nicaise (ed.) *The right to learn: educational strategies for socially excluded youth in Europe*, The Policy Press, Bristol, 2000, p.24.

14 One study showed that while 79 per cent of children whose parents had completed the *Abitur* – the exam normally required for university entrance – were attending *Gymnasium*, only 28 per cent of children from other backgrounds were at this type of school. F. Büchel, J. Frick, P. Krause, and G. Wagner, 'The impact of poverty on children's school attendance – evidence from West Germany' in K. Vleminckx and T. Smeeding (eds.) *Child Well-Being, Child Poverty and Child Policy in Modern Nations: What do We Know?*, The Policy Press, Bristol, 2001. See also other evidence for Germany reviewed in S. Schnepf, 'A sorting hat that fails? The transition from primary to secondary school in Germany', Innocenti Working Paper 92, UNICEF Innocenti Research Centre, Florence, 2002 (available from http://www.unicef-icdc.org/publications/pdf/iwp91.pdf).

15 ***Figure 15*** may also offer a clue to a possible explanation of the poor league table performance of southern Mediterranean countries such as Greece and Portugal. The percentage of students with less than 25 books in the home in these two countries (58 per cent and 45 per cent respectively) is twice as high as in many other OECD nations, probably reflecting the more recent advent of mass compulsory public education. This may influence current school achievement rates as students whose parents have little education tend to face greater difficulties at school.

16 E. Smyth and B. McCabe, 'The educational situation of disadvantaged children' in I. Nicaise (ed.) *The right to learn: educational strategies for socially excluded youth in Europe*, The Policy Press, Bristol, 2000, p.16.

17 E. Smyth and B. McCabe, 'The educational situation of disadvantaged children' in I. Nicaise (ed.) *The right to learn: educational strategies for socially excluded youth in Europe*, The Policy Press, Bristol, 2000, p.19.

18 L. Feinstein, 'Early cognitive inequality in the 1970 cohort', *Economica*, forthcoming 2002.

19 OECD, *Starting Strong – Early Childhood Education and Care*, OECD, Paris, 2001, p.8.

20 The review summarises ECEC policy and practice in the 12 participating OECD countries: Australia, Belgium, the Czech Republic, Denmark,

Sources

Finland, Italy, the Netherlands, Norway, Portugal, Sweden, the United Kingdom and the United States.

21 OECD, *Starting Strong – Early Childhood Education and Care*, OECD, Paris, 2001, p.13.

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23 S. Danziger and J.Waldfogel, 'Investing in children: What do we know? What should we do?', CASEpaper 34, Centre for Analysis of Social Exclusion, London School of Economics, 2000, p.8 (available from http://sticerd.lse.ac.uk/case/publications/casepapers.asp).

24 J. Currie, *Welfare and the Well-Being of Children*, Harwood Academic Publishers, 1995, pp.112-3.

25 OECD, *Starting Strong – Early Childhood Education and Care*, OECD, Paris, 2001, p.96.

26 National Association of Child Advocates, *Making investments in young children: What the research on early care and education tells us*, Issue brief, Washington, December 2000.

27 OECD, *Starting Strong – Early Childhood Education and Care*, OECD, Paris, 2001, p.13.

28 National Association of Child Advocates, *Making investments in young children: What the research on early care and education tells us*, Issue brief, Washington, December 2000.

Most of the analysis in this *Report Card* is based on three international surveys: the Trends in Mathematics and Science Study (TIMSS), the Programme for International Student Assessment (PISA) and the International Adult Literacy Survey (IALS).

TIMSS (formerly known as the Third International Mathematics and Science Study) was first undertaken by the International Association for the Evaluation of Educational Achievement (IEA) during the school year 1994/95. A repeat study was held in 1998/99. Most data were collected during 1995 and 1999 respectively and these years are referred to below. The survey is organised by the International Study Center at Boston College, USA, and a further round of data will be collected in 2003 (see http://www.timss.org).

The target populations studied in 1995 were children in the two grades in which most 9 year-olds (3rd and 4th grade) and 13 year-olds (7th and 8th grade) were enrolled, and the last grade of secondary school. In 1999, the target population was children in the higher of the two grades in which most 13 year-olds were enrolled (the average age of these children across participating countries was 14.4 years). Conventionally, this grade is referred to as the 8th grade, since in most countries it refers to the eighth year of formal schooling, but for example students in Denmark, Finland, Norway and Sweden had one year less of formal schooling, while students in New Zealand and the UK had one year more. This *Report Card* focuses on the 8th grade results but at times refers to those for the 3rd, 4th and 7th grades as well (which refer just to those countries that participated in TIMSS in 1995).

Samples consisted on average of 3,800 8th grade children per OECD country, with an average overall response rate of 88 per cent. Apart from the achievement tests in maths and science, children, teachers and school principals responded to questionnaires collecting a variety of information on individual background and the context of learning.

Between 1995 and 1999, 52 countries including 27 OECD members, participated in the study in one or other – or both – years. For countries which participated in both years, the *Report Card* focuses exclusively on the 1999 data. The data refer to 1995 for Austria, Denmark, France, Germany, Greece, Iceland, Ireland, Norway, Portugal, Spain, Sweden and Switzerland. For Belgium, results of the Flemish (1999) and French (1995) Communities were merged; for the UK, results of England (1999) and Scotland (1995) were merged (with none of the data covering Wales or Northern Ireland). In both cases appropriate weights were used to reflect the sizes of the underlying populations.

As in the other surveys used in this *Report Card*, TIMSS provides an estimate of each child's achievement in the form of a summary score

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based on the application of 'item response models' to the answers given to each question. This process is also known as 'scaling'. The 1995 and 1999 rounds of TIMSS used different procedures to scale the data and the results in the published reports for each of these two rounds are therefore not comparable. However, the 1995 data were re-scaled by the International Study Center at Boston College using the same model as in 1999 and all the results for 1995 in the *Report Card* use these re-scaled data. (The 1999 model is described in K. Yamamoto and E. Kulick, 'Scaling methodology and procedures for the TIMSS mathematics and science scales', in M. Martin, K. Gregory and S. Stemler (eds.), *TIMSS 1999 Technical Report*, International Study Center, Boston College, 2000.)

For additional information see: I. Mullis, M. Martin, E. Gonzalez, K. Gregory, R. Garden, K. O'Connor, S. Chrostowski, T. Smith, *TIMSS 1999 International Mathematics Report*, Boston College, 2000; and M. Martin, I. Mullis, E. Gonzalez, K. Gregory, T. Smith, S. Chrostowski, R. Garden, K. O'Connor, *TIMSS 1999 International Science Report*, International Study Center, Boston College, 2000, available from the TIMSS web site, http://www.timss.org. The TIMSS microdata are also available on the same web site.

PISA is a survey of 15 year-olds, intended to assess their preparedness for adult life near the end of compulsory schooling through measurement of mathematics, science and reading literacy. It is co-ordinated by the OECD (see http://www.pisa.oecd.org).

The target population for PISA consists of all 15 year-olds in school irrespective of the grade they are in. On average, 15 year-olds have been attending school for between 8.9 years (Finland, Switzerland) and 11 years (New Zealand).

Data in this *Report Card* are drawn from the first PISA assessment, which took place in 2000 (with the main focus on reading). Assessments will subsequently occur every three years (with the main focus on maths in 2003 and on science in 2006). In 2000, 32 countries including 28 OECD members participated (note that UK data do not cover Wales). On average almost 5,700 15 year-olds were assessed per OECD country, with an average overall response rate of 85 per cent. Apart from the achievement tests, children and school principals responded to questionnaires on family background and the school respectively.

For additional information see: OECD, *Knowledge and Skills for Life – First results from PISA 2000*, OECD, Paris, 2001, available from the PISA web site. The survey microdata are also available on the same web site.

IALS was undertaken by Statistics Canada and the OECD in 1994, 1996 and 1998, different countries participating in each year (see http://www.nald.ca/nls/ials/introduc.htm). It was designed to measure the extent to which people of working age (16 to 65) are able to use literacy skills to perform everyday tasks, through the assessment of proficiency in three domains: prose (understanding and using information from texts), document (locating and using information contained in various formats) and quantitative (applying arithmetic operations to numbers embedded in printed materials).

Twenty-one countries including 19 OECD members participated in IALS. Canada, France, Germany, Ireland, Netherlands, Poland, Sweden and the United States participated in 1994, Australia, Belgium, New Zealand and UK in 1996, and the rest in 1998. Samples averaged 3,400 persons per country including an average of nearly 700 16 to 25 year-olds. Average response rate was 62 per cent. A background questionnaire collected information on a variety of subjects including labour market activity.

For additional information see: OECD and Statistics Canada, *Literacy in the Information Age – Final Report of the International Adult Literacy Survey*, Paris, 2000. Microdata from IALS are available on CD-rom from OECD and Statistics Canada. The successor to IALS is the Adult Literacy and Lifeskills Survey, to be held in 2002. For further information see http://www.ets.org/all/index.html.

The absolute (***Figure 1***) and relative (***Figure 4***) leagues of educational disadvantage are restricted to those countries that participated in both PISA (2000) and TIMSS (1995 and/or 1999). Luxembourg, Poland and Mexico are not in these tables since they did not participate in TIMSS. Mexico would come at the bottom of the PISA league table of absolute disadvantage in reading (***Figure 2a***) with a value of 44 per cent, Luxembourg in penultimate place with 35 per cent, and Poland just above Greece and Portugal with 23 per cent. The Netherlands is not in the tables, despite being in both PISA and TIMSS, since its PISA sample was considered insufficiently reliable by the OECD to provide adequate estimates. The Netherlands would be in 3rd position in the TIMSS maths league table (***Figure 2b***) with 19 per cent. Also not included in the first round of PISA were the Slovak Republic and Turkey, countries that would come, respectively, in 7th place with 22 per cent and in last place with 73 per cent in the TIMSS maths league (all 1999 data).

In ***Figures 1, 2, 3, 8, 9, 10a, 10c, 11*** and ***12*** 'absolute disadvantage' means being at a low level of achievement/literacy relative to a common international benchmark. This is measured as the percentage of children/young people beneath a given score in the survey concerned. For TIMSS maths, the children below the benchmark are those deemed by the TIMSS organisers to be unable to "apply basic mathematical knowledge in

straightforward situations" and for TIMSS science to be unable to "recognise and communicate basic scientific knowledge across a range of topics." The benchmarks are defined in practice by the survey organisers as the international medians among all children in all 38 countries included in the TIMSS survey in 1999.

For PISA reading, children at a disadvantage are those typically deemed by the survey organisers to be unable to locate information in a text that may need to be inferred, who cannot recognise the main theme when information is not prominent, and who cannot make comparisons or connections between the text and their own knowledge or personal experience. In terms of the five levels of reading literacy defined in PISA these are the children at or below level 1. No levels of maths or science literacy were defined in the same way in PISA 2000 (since reading was the focus in this first round of PISA data collection – see above). Therefore in the case of PISA maths and science the *Report Card* takes the arbitrary benchmarks of the international bottom quartiles (the 25th percentiles) among all children in the OECD countries participating in PISA. OECD samples were pooled adjusting for differences in sample sizes so that all countries contributed equally to this pool. The values of these benchmarks were taken from the National Center for Education Statistics, *Outcomes of Learning – Results from the 2000 Program for International Student Assessment of 15-year-olds in Reading, Mathematics, and Science Literacy*, Washington DC, 2001, available at http://nces.ed.gov/surveys/pisa. In the case of PISA reading, the rank correlation coefficient between the percentage of children at or below level 1 and the percentage below the international bottom quartile for OECD countries is 0.99.

For literacy in each of the three dimensions measured by IALS, young people at an absolute disadvantage are defined as those at IALS literacy level 1 (the lowest level) and are persons deemed by the IALS organisers to have "very poor literacy skills, where the individual may, for example, be unable to determine the correct amount of medicine to give to a child from information printed on the package."

In ***Figures 4, 5, 8, 10b*** and ***17*** 'relative disadvantage' means being at a low level of achievement/literacy relative to a national benchmark. This is measured for each country as the difference between the values of the 5th percentile and the 50th percentile of the national distribution of achievement/literacy score. Countries with greater relative disadvantage are countries with a greater distance between the 5th and 50th percentiles.

Figures 1, 3, 4, 5, 10, 17 and ***18*** show 'average ranks' of absolute or relative disadvantage. In all cases these are simple arithmetic averages of the rank values in each of the rankings concerned, giving equal weight to each ranking. For example, ***Figure 1*** shows the average value of each country's rank on a measure of absolute disadvantage (defined above) in PISA reading, PISA maths, PISA science, TIMSS maths and TIMSS science where the rank values on each of these five measures gets equal weight.

Figures 2a and ***2b***. The differences between any two countries' values of absolute disadvantage are statistically significant at the five per cent level in 77 per cent of cases for PISA reading and 78 per cent for TIMSS maths (the Bonferroni adjustment for multiple comparisons is not applied in these calculations). The standard errors used in these tests were kindly supplied by the survey organisers (and are produced by jack-knifing on account of the surveys' sample designs). On average, in the case of PISA reading any country could be expected to change place exactly one rank (i.e. 1.0 ranks) were fresh samples of data to be drawn (a conclusion based on the results of a Monte Carlo experiment with 10,000 simulations). For relative disadvantage, the differences between any two countries' values are statistically significant (at the five per cent level) less frequently: in only 42 per cent of cases for PISA reading, 35 per cent of cases for TIMSS science and 26 per cent of cases for TIMSS maths. For this reason ***Figure 2*** is not complemented in the *Report Card* by an analogous diagram giving the country values on one or more of the five rankings that enter the average in ***Figure 4***. However, the fact that the average ranks vary so much in ***Figure 4*** confirms that the information they contain is not just statistical 'noise' generated by sampling variation.

Figures 6 and ***16*** are produced using Epanechnikov kernel density estimates evaluated at 50 points with halfwidth of 11/13 points using Stata 7.0, based on TIMSS 1995 re-scaled microdata (first 'plausible value').

Expenditure data in ***Figure 10a*** are from OECD, *Knowledge and Skills for Life – First results from PISA 2000*, OECD, Paris, 2001, p.264 (available from http://www.pisa.oecd.org). Cumulative expenditure has been approximated by the OECD by multiplying public and private expenditure on educational institutions per student in 1998 at each level of education by the theoretical duration of education at the respective level, up to age 15.

The data on income inequality in ***Figure 10b*** refer to the distribution by individuals of per capita household income and come from various sources: European Community Household Panel (ECHP) microdata for wave 3 (Greece, Ireland, Portugal), J. Flemming and J. Micklewright, 'Income Distribution, Economic Systems and Transition', Innocenti Occasional Paper No. 70, 1999 (Czech Republic), UNICEF Innocenti Research Centre MONEE project (Hungary), UN WIDER World Income Inequality

Database (New Zealand), and Luxembourg Income Study (LIS) microdata (all other countries). The years to which the data refer are 1998 for Hungary, 1997 for New Zealand and USA, 1996 for Belgium, Czech Republic, Greece, Ireland, Korea and Portugal, 1995 for Austria, Canada, Finland, Italy, Norway, Sweden and the UK, 1994 for Australia, France, and Germany, 1992 for Denmark, Japan and Switzerland and 1990 for Spain.

Data in ***Figure 10c*** on pupil/teacher ratios in secondary education are from OECD, *Education at a Glance –OECD Indicators*, Paris, 2001. In Australia and the UK data include general programmes only. In Iceland, Norway and the UK they refer to upper secondary education only, and in Switzerland to public institutions only.

In ***Figures 11*** and ***12***, the average across OECD countries for the proportion of non-native and first-generation students is 9 per cent. Non-native students are students who were foreign-born and whose parents were also foreign-born. First-generation students are students who were born in the country of assessment but whose parents were foreign-born (OECD definition). Note that weighting the values reported in ***Figure 11*** does not reproduce the PISA values in ***Figure 2a***, since children who did not respond to the questions on country of birth of their parents are not included in ***Figure 11***. In the OECD area as a whole, excluding Korea (where data on migrant status of children in PISA are not available), these students are 5 per cent of the total. Note also that countries participating in PISA were permitted to exclude up to a total of 5 per cent of the relevant population, and that exclusions within these limits included non-native language speakers with less than one year of instruction in the language of assessment. (Note that ***Figures 11*** and ***12*** exclude Luxembourg, Poland and Mexico – present in PISA – since as explained earlier these countries do not enter the *Report Card's* league tables on account of their absence from TIMSS.)

Figure 13 is based on data for English schools from the Department for Education and Skills, '2001 GCSE/GNVQ Autumn Package', pp.57-59 (available from http://www.standards.dfes.gov.uk/performance). It refers to all state-maintained, non-selective schools: selective ('grammar') schools are not included (these are 5 per cent of all state schools) nor are private schools. Children whose parents receive Income Support (means-tested support for low income families), Income-based Job Seekers Allowance (means-tested unemployment benefit), or Support for Asylum-Seekers are entitled to Free School Meals, which is taken as a measure of disadvantage. The figures for Free School Meals refer to children of all ages of 15 and below (at 31 August 2000) in each school. The General Certificate of Secondary Education (GCSE) is a single-subject examination normally taken at age 16 (at the end of compulsory education), and intended to be the main method of assessment at this age in England. Children take a range of subjects (normally between five and eight). The results are reported on an eight-point scale: A*, A, B, C, D, E, F and G. A minimum of five GCSE passes at grades A* to C are normally required for entry into post-compulsory secondary education of a more academic nature. General National Vocational Qualifications (GNVQs) are broad vocational qualifications related to a particular industry or sector of the economy. At the intermediate level they are equivalent to two (Part 1) or four (Full) passes at grades A* to C. (Information taken from http://www.eurydice.org/Eurybase/Application/eurybase.htm).

Data in ***Figure 13*** on low achievement and mother's education are from OECD, *Knowledge and Skills for Life – First results from PISA 2000*, OECD, Paris, 2001, p.291. For all countries, the ratio is significantly greater than one (in the sense of statistical significance). (For more information on family background and school attainment see, for example, Y. Shavit and H-P. Blossfeld (eds), *Persistent Inequality: Changing Educational Attainment in Thirteen Countries*, Westview Press, Boulder, 1993, and H. Ishida, W. Müller and J. Ridge, 'Class origin, class destination and education: a cross-national study of ten industrial nations', *American Journal of Sociology*, 1995, n.101, pp.145-93.)

In ***Figure 15*** the percentage of children in homes with less than 26 books ranges from 11 per cent in Australia to 58 per cent in Portugal with an average of 25 per cent. The information on the family or home on which both these graphs are based was supplied by the child who in some cases was unable to answer the relevant question. For example, on average 8 per cent of 3rd grade children among OECD countries in TIMSS could not estimate the number of books in their home. The ratios of probabilities are based on the values of achievement for those children who could supply the required information (the percentages cited above for the number of children in homes with less than 26 books refers only to those able to answer the relevant question).

Box 1

Testing, testing...

The account of the surveys is based on the published TIMSS, PISA and IALS reports (see the start of this Sources section) and on: National Statistics, *International Student Assessment – Results for England 2000*, London, 2001 (available from http://www.statistics.gov.uk/releases).

Box 2

Germany: children sorted for life

The diagram in the box is based on analysis of TIMSS 1995 (rescaled) microdata and was produced using Epanechnikov kernel density estimates evaluated at 50 points using Stata 7.0. The recent study of adult wages by school type attended during childhood is C. Dustmann, 'Parental Background, Primary to Secondary School Transitions, and Wages', IZA Discussion Paper 367, 2001 (available from http://www.iza.org). The study of Rhineland-Palatinate is H. Mahr-George, *Determinanten der Schulwahl beim Übergang in die Sekundarstufe I, 1999*, Leske + Budrich, Opladen, 1999. The study of Hamburg is R.H. Lehmann, R. Peek and R. Gänsfuß, *Aspekte der Lernausgangslage und der Lernentwicklung von Schülerinnen und Schülern, die im Schuljahr 1996/97 eine fünfte Klasse an Hamburger Schulen besuchten*, 1997 (available from http://www.hamburger-bildungsserver.de/lau/lau5/). These papers, and others, are reviewed in more detail in S. Schnepf, 'A Sorting Hat that Fails? The Transition from Primary to Secondary School in Germany', Innocenti Working Paper 92, UNICEF Innocenti Research Centre, Florence, 2002 (available from http://www.unicef-icdc.org/publications/pdf/iwp92.pdf). This paper also contains more detailed analysis of the 1995 TIMSS and 2000 PISA microdata for Germany together with further details of the process of entry into secondary schools.

Box 3

Attainment versus achievement

Data on the percentage of 18 to 24 year-olds in 1997 not in education and with low qualifications are from: Eurostat and European Commission, *The social situation in the European Union 2000*, p.15 (Source: EU Labour Force Survey). They refer to those that have completed only ISCED (International Standard Classification of Education) level 2 or below. The more recent 1999 data appearing in the 2001 edition are not used since in this edition those young people in the UK not in education who have *any* passes in GCSE exams (normally taken at age 16), even in just one subject, appear to be considered at ISCED level 3, i.e. having successfully completed upper secondary education. This has the result that the percentage of UK 18 to 24 year-olds not in education and with low qualifications is given as only 7 per cent in *The social situation in the European Union 2001* compared to 30 per cent in the 2000 edition (the figure used in the graph in the box). This figure of 7 per cent seems very misleading since a person in possession of, for example, only one GCSE pass would normally be considered someone who is very lowly qualified. (See the description of the sources to ***Figure 13*** for more information on the GCSE examination.)

Box 4

Sweden: reform reduces inequality

This draws on C. Meghir and M. Palme, 'The effect of a social experiment in education', Institute for Fiscal Studies Working Paper 01/11, 2001 (available from http://www.ifs.org.uk). The estimates of the impact of the reform were obtained using a propensity score matching technique and the paper reports confidence intervals (based on bootstrapped standard errors) for the percentages reported in the box.

Box 5

Maths achievement beyond the OECD

The measure of absolute disadvantage in the diagrams is the same as that for TIMSS maths achievement in ***Figure 2b***: a score beneath the median among all children in all countries participating in TIMSS 1999. The data for non-OECD countries in TIMSS refer to 1999 except in the cases of Colombia and Kuwait where they refer to 1995. Data on enrolment rates are mostly from The World Bank, *2001 World Development Indicators CD-rom*, and refer to 1997. (Source: school enrolment data as reported to UNESCO by national education authorities.) Data for Cyprus, Iceland and the Russian Federation are from: http://www.uis.unesco.org/en/stats/stats0.htm. Data for Taiwan, Province of China, is from Ministry of Education, http://www.edu.tw/english/. Net enrolment rates have been imputed from gross enrolment rates in Iceland, Israel, Italy, Malaysia, Moldova, Morocco, Russian Federation, Singapore, Slovak Republic, Slovenia, Spain, Thailand and Tunisia, based on a regression for the other countries in the diagram all of which have both gross and net enrolment rates: $net = -67.56 + 2.54 * gross - 0.01 * gross^2$ (t-statistics: –4.3, 7.8 and –6.2 respectively, R^2: 0.83). The gross enrolment rate is the ratio of total enrolment, regardless of age, to the population of the age group that officially corresponds to the level of education shown. The net enrolment rate is the ratio of the number of children of official school age for the level of education shown (as defined by the national education system) who are enrolled in school to the population of the corresponding official school age for the level of education shown.

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